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## Review of Department of the Navy, Judge Advocate General's Surface Ship Fire Investigation Reports for the Period 1980 Through 1986

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)  Ship fire loss data for the period 1980 to 1986 were developed by analyzing Department of the Navy, Judge Advocate General (JAG) investigation reports. The data were summarized using the Navy Fire Loss History Reporting Form which was used in a previous effort to summarize fire data from the period 1960 to 1979. This report outlines the summary technique, and presents recurring or common lessons learned. A total of 224 incidents were summarized including 190 surface ship fires, 6 submarine fires, 3 aircraft crashes on ships and 21 incidents of accidental fire extinguishing agent discharge. Summary reports for each incident will be presented in a subsequent report.					
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## CONTENTS

BACKGROUND .....	1
OBJECTIVE .....	1
PROJECT CHRONOLOGY .....	2
REPORT SUMMARY TECHNIQUE .....	3
COMMON/RECURRING LESSONS LEARNED .....	3
Procedural/Personnel Related .....	6
Equipment/Design Related .....	8
MATRIX SUMMARY .....	11
GENERAL TRENDS AND SUMMARY .....	11
Recurring Lessons Learned .....	12
Procedural/Personnel Related .....	12
Equipment/Design Related .....	13
Trends in Large Loss Fire .....	14
DEFINITIONS AND ABBREVIATIONS .....	15
REFERENCES .....	15
APPENDIX A — List of JAG Reports 1980-1987 .....	17
APPENDIX B — List of JAG Report Not Available for Review .....	25
APPENDIX C — Submarine Fire Incidents .....	29
APPENDIX D — Standard Report Form .....	57
APPENDIX E — Cross-Reference Matrix of JAG Fire Reports .....	67
APPENDIX F — Abbreviations and Definitions Space Designation .....	91



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**REVIEW OF DEPARTMENT OF THE NAVY, JUDGE ADVOCATE  
GENERAL'S SURFACE SHIP FIRE INVESTIGATION REPORTS  
FOR THE PERIOD 1980 THROUGH 1986**

**BACKGROUND**

The Navy Technology Center for Safety and Survivability, which is part of the Chemistry Division at the Naval Research Laboratory (NRL), was tasked by the NAVAL SEA SYSTEMS COMMAND, SEA 56Y5, to update the ship fire loss data base obtained by summarizing investigations and reports prepared by the Department of the Navy, Judge Advocate General (JAG). A data base exists for the period 1960 to 1979 [1]. A JAG investigation is conducted for situations where any U.S. Navy personnel, equipment, ship or facility is involved in an incident which results in death, injury, substantial loss or loss under suspicious circumstances, or where legal culpability is to be decided.

**OBJECTIVE**

The objective of this task was to update the ship fire loss data base from 1980 to 1986. It was not intended for this effort to be a detailed statistical analysis of loss data, but rather it is a general summary of the available JAG Investigation Reports. After each applicable JAG report was summarized using the same basic reporting format, this report was prepared to outline the project, highlight recurring or common lessons learned and to generate a matrix summary of the reports.

This report presents common or recurring lessons learned by the investigating officers. It is important to note that in the majority of incidents, no (or relatively minor) deficiencies were noted and the lessons learned contained positive comments on the actions of the crew, fire fighting equipment, etc. After each topic area in the "Common/Recurring Lessons Learned" section, all JAG Reports are listed which identify the particular issue as pertinent to the fire. This listing indicates the relative frequency of the particular problem and provides a source of additional detail.

*Manuscript approved September 26, 1989.*

## PROJECT CHRONOLOGY

The JAG office has two methods for cataloging their reports. All reports prior to 1985 are cataloged in a card file which had to be searched for all fire incidents involving ships. To identify cases where an aircraft crash resulted in a fire on a ship, the aircraft (listed as "Plane") category had to be searched. After 1984 a computer data base system was used to catalog the reports and made searching through the categories for fire incidents much easier. In either case, all reports involving a fire, explosion or fire fighting agent discharge (listed under "Ship Damage") on a ship were listed. A total of 302 reports were identified.

Reports prior to 1985 are stored at the Federal Records Center in Suitland, Maryland. These reports were ordered and arrived within six weeks. Reports completed after 1984 were stored in the JAG office in Alexandria, Virginia.

Of the 302 JAG reports identified, 224 were summarized with the same reporting form used in the previous effort. Appendix A lists all of the applicable JAG reports which were reviewed. The remaining 78 JAG reports were not obtainable or summarized because they were lost (37), checked out (9), or obviously not applicable (32). A list of the JAG reports which were not summarized is provided in Appendix B.

Of the 224 summarized reports, 4 are classified and will be forwarded under a separate cover. Of the remaining 220 reports, 190 are surface ship fires or boiler explosions, 3 are aircraft crash induced ship fires, 6 are submarine fires and 21 are cases of accidental fire extinguishing agent discharge. In the case of boiler explosions, 1 resulted in a fire spreading beyond the boiler and 11 in no fire. When a fire ensued from a boiler explosion the incident was treated and summarized the same as a ship fire. When the boiler explosion did not cause a fire, the reporting form was partially completed to include only the incident date, ship name and number and a brief description of the incident as a boiler explosion which did not result in a fire.

Of the 190 surface ship fires there were 37 reported cases where arson was determined or suspected to be the cause. There were 6 incidents involving submarines. Five of the submarine reports are in a separate section, Appendix C. The sixth is classified and with the other classified reports.

In addition to the JAG Reports, investigation reports compiled by the Naval Sea Systems Command, Naval Material Command or Naval Facilities Command were utilized to provide

additional details and lessons learned for a number of major incidents. These reports were found attached to the JAG Report or were provided by SEA 56Y52. Where used to support the JAG investigative report, separate investigation reports are referenced in the summary report.

#### REPORT SUMMARY TECHNIQUE

The Navy Fire Loss History Reporting Form developed by Rolf Jensen and Associates for their review of JAG Reports [1] was utilized. A copy is shown in Appendix D.

Appendix D also contains an explanation of the terms used in the reporting form and a blank copy of the form. After the JAG Reports were summarized, the summaries were reviewed for technical accuracy, clarity and cohesiveness.

A check-off for "Early Warning" under the Equipment/Material/Personnel/Design section was added. A "yes" was indicated for the question "Would Early Warning Have Mitigated The Loss?" when the reviewer felt that a fire detection system (smoke and/or heat) would have reduced the delay in discovering the fire and thereby reduced the damage caused by the fire. This item was also checked "yes" if a detection system was in place and footnotes were used to give additional details. If the loss was insignificant, "yes" was checked and explanatory footnotes were provided which indicated that although the loss was minor, early warning would have reduced the time from ignition to discovery of the fire. This item was checked "no" when the fire was discovered immediately after ignition as would happen if the space was occupied at the time of ignition. If the JAG Report contained insufficient information to make this determination, then this was indicated. The objective was to evaluate the potential benefit of a fire detection system on the particular fire loss.

#### COMMON/RECURRING LESSONS LEARNED

This section presents those lessons learned which appeared in the JAG reports more than once during the course of this summary project and which indicate a need for further action. These lessons learned were identified by the JAG investigating officer, endorsing officers or the fire protection engineer who summarized the JAG reports. The lessons learned are summarized in Figs. 1 and 2. General recommendations for each of these recurring lessons learned are given in Appendix E.

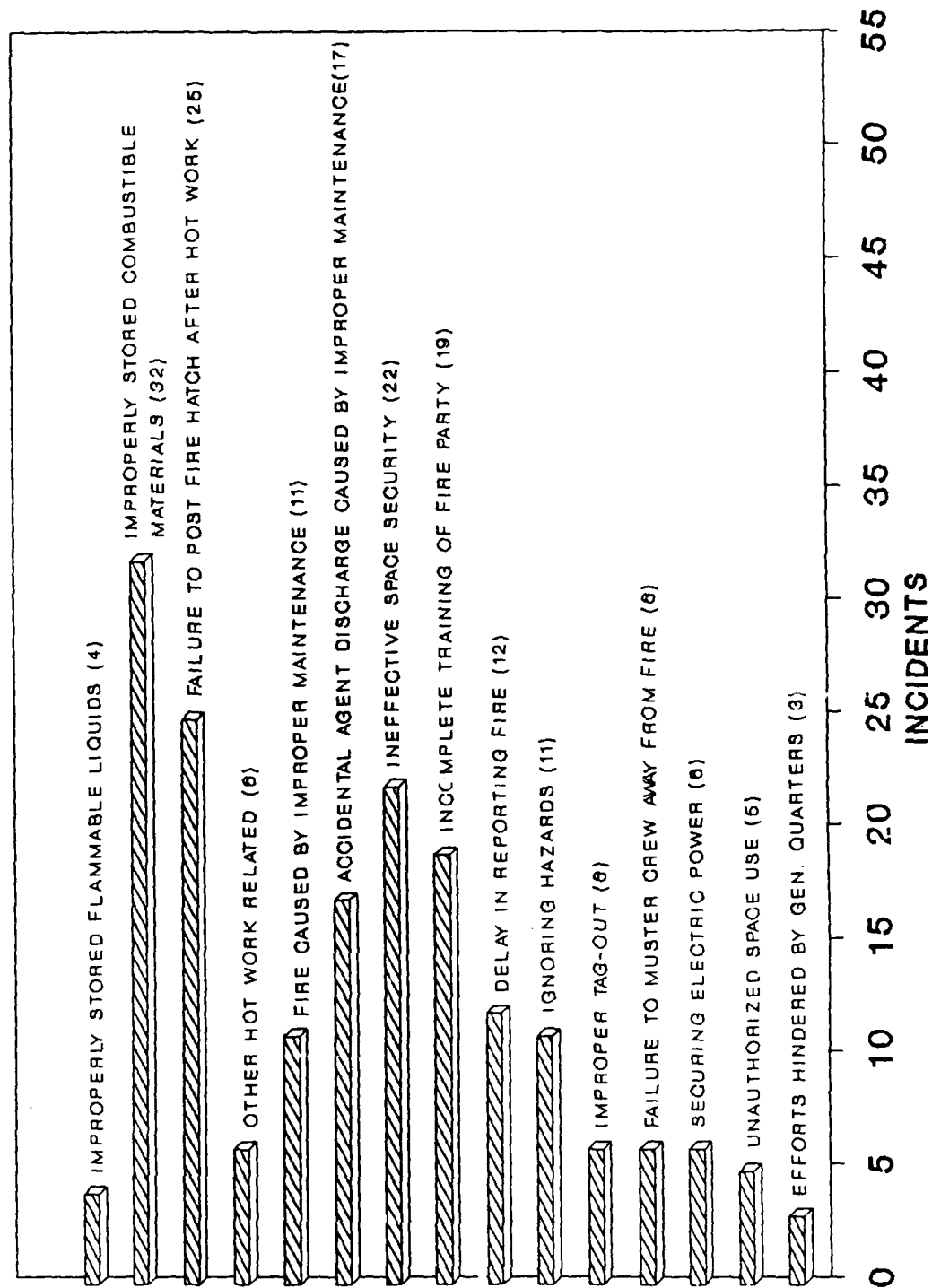


Fig. 1. Procedural/personnel related incidents

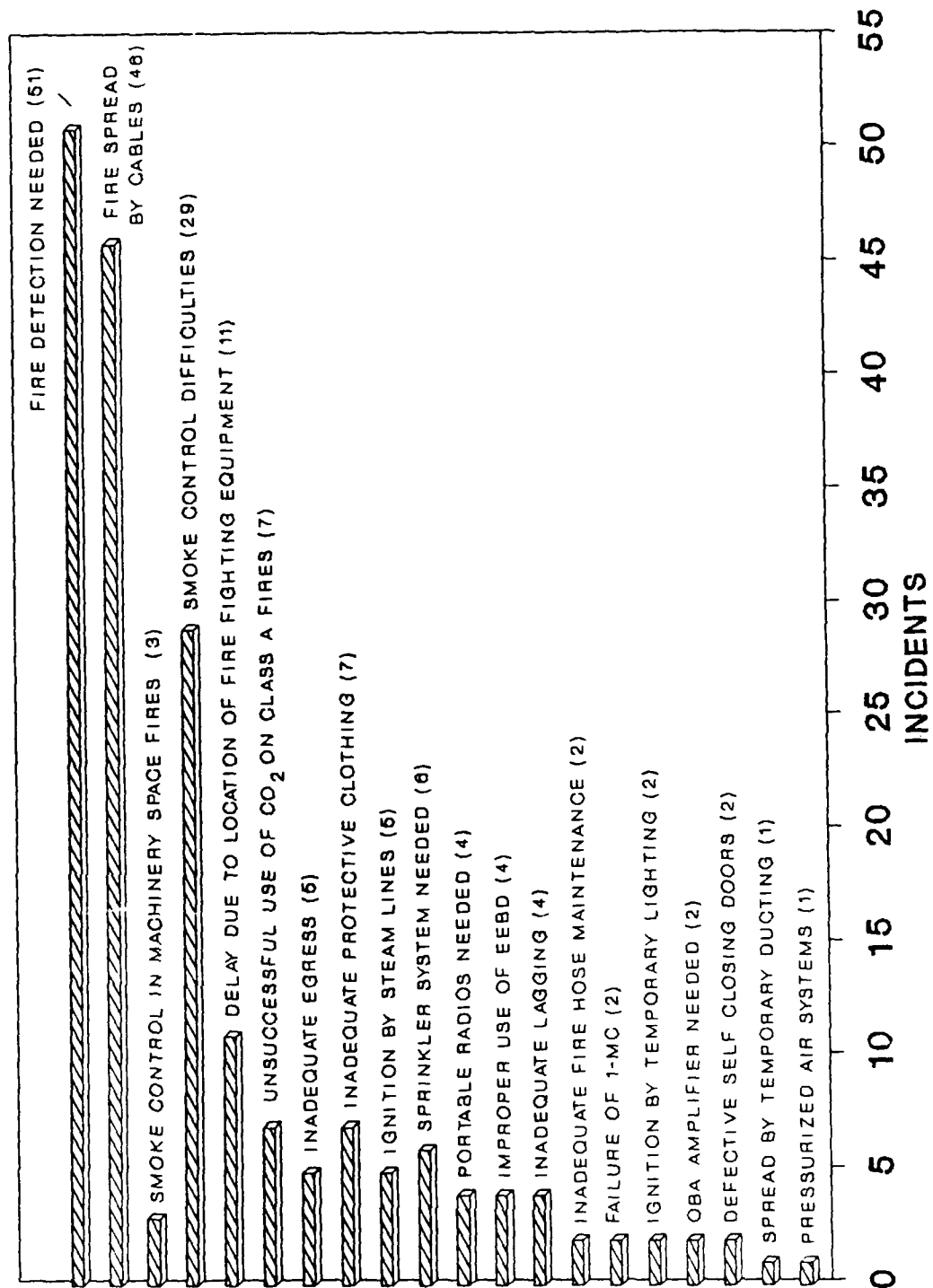


Fig. 2. Equipment/design related incidents



## Procedural/Personnel Related

1. Storage: There were 36 incidents where flammable liquids (4 cases) and/or combustible materials (32 cases) were improperly stored. This included unauthorized storage (storage of material in a non-storage area), storage of a hazardous material in a storage area which was not designed for such a hazard, e.g., storing flammable liquid in a non-sprinklered storeroom, and excessive amounts of material in a storage area. Applicable Reports: JAGs 6460-79, 920-80, 3295-80, 4294-80, 5381-80, 1025-81, 5131-81, 5712-81, 6868-81, 923-82, 946-82, 1298-82, 1385-82, 3610-82, 4046-82, 5358-82, 2247-83, 2977-83, 3363-83, 3403-83, 3404-83, 4073-83, 0806-84, 2003-84, 3324-84, 4287-84, 4603-84, 3354-85, 3674-85, 4372-85, 4391-85, 4620-85, 1858-86, 2194-86, 2196-86, 4597-86.

2. Hot Work: Hot work was a recurring cause of fires on ships. There were 31 incidents where this was the case. The primary reason cited 25 times, was the failure to post a fire watch or the failure of assigned fire watch personnel to follow proper procedures. In some cases, personnel assigned to the fire watch had not received proper training in hot work watch procedures. Failure to maintain a fire watch 30 minutes after completion of hot work was also a contributing cause. Applicable Reports: JAGs 2319-80, 4389-80, 2595-81, 6868-81, 0623-82, 923-82, 1464-82, 4381-82, 4427-82, 5717-82, 2316-83, 3909-83, 4062-83, 0220-84, 0226-84, 1258-84, 1395-84, 4287-84, 1211-85, 4325-85, 0218-86, 0256-86, 1815-86, 1858-86, 1630-87.

Inexperienced or untrained welders were responsible for starting 6 fires during hot work. Applicable Reports: JAGs 2319-80, 2595-81, 1258-84, 4325-85, 0256-86, 1630-87.

3. Maintenance: Improper maintenance was cited in 28 incidents as the cause of fires or the accidental activation of fire suppression systems. In the 17 incidents where a fire resulted, the maintenance personnel failed to follow and/or complete the proper maintenance procedure. This resulted in an equipment failure or flammable liquid leak. Applicable Reports: JAGs 5437-80, 4940-81, 1385-82, 0071-83, 0585-84, 1421-84, 2434-84, 2528-84, 2630-84, 3467-84, 3197-85, 3960-85, 1516-86, 3136-86, 4135-86, 4364-86, 4655-86.

In most of the 11 incidents where a fixed fire suppression system (sprinkler, CO<sub>2</sub> or Halon 1301) was accidentally activated, maintenance was either being performed or had been recently completed. Applicable Reports: JAGs 2825-79, 3595-82, 4064-82, 5738-82, 0104-83, 0868-83, 4133-83, 2199-84, 3789-84, 0127-85, 0701-86.

4. Space Security: Spaces which should have been secured (locked) because of hazardous contents (e.g., flammable liquids, ordnance) but were not for various reasons presented an opportunity for 22 accidental or arson fires. Security watches should ensure that these spaces are secured. Damage control personnel should regularly survey the ship to locate unsecured, unprotected spaces which are a fire hazard. Applicable Reports: JAGs 626-80, 1831-80, 3295-80, 5375-81, 1385-82, 2345-82, 3610-82, 4046-82, 4067-82, 5586-82, 1510-83, 2247-83, 3403-83, 4632-83, 3319-84, 4603-84, 3674-85, 3781-85, 4296-85, 4391-85, 4396-85, 0602-86.

5. Training: Deficiencies in the actions of fire party personnel while fighting a ship fire were attributed to a lack of, or incomplete training in 19 incidents. Many of these incidents show that, despite their regularity, damage control team drills are not necessarily realistic or complete. Applicable Reports: JAGs 438-80, 4382-80, 3809-82, 2247-83, 2316-83, 3228-83, 3363-83, 3827-83, 4073-83, 1344-84, 1828-84, 2434-84, 0012-85, 2237-85, 3156-85, 4372-85, 4396-85, 4648-86, 4655-86.

6. Communication of Alarm: The immediate notification of the bridge or quarterdeck by the person discovering the fire and the immediate notification of ship's force and civilian or base fire departments is important. In 12 incidents, delays occurred in one or both of these communication links which probably contributed to the level of damage. Applicable Reports: JAGs 0374-82, 1385-82, 2464-82, 4046-82, 2247-83, 3257-83, 3615-83, 4632-83, 2003-84, 2264-84, 3337-84, 4187-84.

7. Hazard familiarization: Eleven incidents were cited where the crew/shipyard workers ignored hazards inherent to a particular operation or equipment. Safety procedures were commonly ignored or only partially followed. Adherence to safety procedures would have prevented or lessened the damage or injury. Applicable Reports: JAGs 424-80, 2649-81, 3575-81, 5131-81, 6868-81, 946-82, 1298-82, 1464-82, 1258-84, 1828-84, 4187-84.

8. Tag-Out: There were 6 incidents where proper tag-out procedures were not followed. In some cases a fire was caused by a piece of equipment which should have been tagged-out to prevent its use. In other instances personnel wasted time trying to use inoperative fire fighting equipment which should have been tagged-out. Applicable Reports: JAGs 1139-81, 1464-82, 3923-83, 5066-83, 2742-85, 5302-86.

9. Crew Mustering: Crew members and shipyard workers who were not involved with fire fighting efforts should muster away from the fire area. In 6 incidents, the failure

of personnel to muster away from the fire area hampered fire/fighting efforts. A lesson learned is that all non-fire party personnel should be directed to assemble in a convenient area (e.g., hangar deck, fantail, or on the pier). Applicable Reports: JAGs 5360-80, 064-82, 5717-82, 1232-83, 2247-83, 1634-86.

10. Electric Power: Securing electric power to the fire area can be an important action in damage control. Fire parties experienced difficulties in accomplishing this in 6 incidents. Problems were frequently attributed to lack of accurate diagrams, unfamiliarity with the circuits, or multiple power sources. There were also cases where the improper securing of power, resulting in loss of lighting or ventilation, hampered fire fighting efforts. Applicable Reports: JAGs 1783-83, 3923-83, 1421-84, 1317-85, 1626-86, 3362-86.

11. Space Use: The unauthorized use of a space was cited as a contributory cause in 5 incidents. Most often this involved smoking in a smoking prohibited space. Applicable Reports: JAGs 438-80, 6868-81, 1569-82, 4296-85, 1466-86.

12. General Quarters: The use of General Quarters and setting of condition ZEBRA was cited in 3 incidents as a hindrance to fire fighting efforts. Problems involved manpower staging, securing of ventilation, and movement of equipment and supplies to the scene. Applicable Reports: JAGs 2319-80, 883-81, 4482-85.

#### Equipment/Design Related

1. Fire Detection: Operation of a properly designed, installed and maintained fire detection system may have reduced discovery time and may have reduced the fire loss in 51 incidents. Applicable Reports: JAGs 6460-79, 438-80, 920-80, 1831-80, 2165-80, 3295-80, 4294-80, 5360-80, 5381-80, 1139-81, 2649-81, 2858-81, 3575-81, 4745-81, 5712-81, 0142-82, 0623-82, 756-82, 923-82, 946-82, 1569-82, 2564-82, 3595-82, 3610-82, 3809-82, 4046-82, 4067-82, 4427-82, 1510-83, 2247-83, 3135-83, 3228-83, 3257-83, 3403-83, 4632-83, 0585-84, 0806-84, 1258-84, 1344-84, 2003-84, 2733-84, 3319-84, 3324-84, 3337-84, 3460-84, 4287-84, 4603-84, 0133-85, 1211-85, 1317-85, 3194-85, 4620-85, 0218-86, 0602-86, 1626-86, 1858-86, 2196-86, 3362-86, 1630-87.

There were six cases where a detection system was installed and operated properly. Applicable Reports: JAGS 3674-85, 4296-85, 4372-85, 4391-85, 1534-86, 4597-86.

2. Cables: Overhead cabling in compartments contributed significantly to the fuel load in the compartments and provided a means for fire spread in 46 incidents. Applicable Reports: JAGs 0920-80, 0933-80, 1542-80, 3483-80, 4382-80, 4389-80, 5437-80, 1139-81, 2649-81, 5131-81, 6868-81, 0064-82, 0142-82, 0946-82, 1476-82, 2345-82, 5717-82, 2247-83, 2316-83, 2744-83, 3257-83, 3339-83, 3363-83, 3403-83, 3404-83, 3615-83, 3827-83, 3923-83, 5066-83, 0220-84, 0585-84, 1258-84, 1344-84, 1828-84, 1909-84, 4287-84, 0378-85, 0414-85, 1317-85, 3197-85, 4296-85, 4391-85, 4396-85, 4410-86, 5036-86, 5504-86.

3. Space Ventilation: The proper setting of machinery space ventilation systems was unknown at the time of the fire in 3 incidents and probably contributed to the spread of fire and/or smoke. Applicable Reports: JAGs 0414-85, 3354-85, 5504-86.

Locating and fighting a fire was often hampered by smoke. Ventilation was usually accomplished by using Red Devil Blowers but these were not sufficient or utilized properly in 29 incidents. Despite these problems the JAG investigator could rarely give specific recommendations for dealing with the smoke problem. Applicable Reports: JAGs 3840-79, 2165-80, 4382-80, 5360-80, 5437-80, 2595-81, 5712-81, 646-82, 1476-82, 2464-82, 5708-82, 2744-83, 3135-83, 3909-83, 5066-83, 0806-84, 1395-84, 1828-84, 2733-84, 4287-84, 0378-85, 0414-85, 1317-85, 2940-85, 3354-85, 4391-85, 2196-86, 4364-86, 4893-86.

4. Location of Fire Fighting Equipment: In 11 incidents there was a significant delay in extinguishing the fire because either the equipment or the activating mechanism for a fixed sprinkler or gaseous system was improperly located. In some cases the equipment was too close to the fire and could not be reached or it was too far away and valuable time was lost in moving it to the fire area. Applicable Reports: JAGs 3840-79, 993-80, 5437-80, 1139-81, 756-82, 1476-82, 1909-84, 2434-84, 0133-85, 3136-86, 4410-86.

5. CO<sub>2</sub> Extinguishers: Carbon dioxide portable extinguishers were unsuccessfully used on Class A or B fires in 7 incidents. Applicable Reports: JAGs 883-81, 1139-81, 6868-81, 0374-82, 3404-83, 3615-83, 1395-84.

6. Egress: It is desirable to have a minimum of two remote, separate means of egress from every space. This is particularly important during in-port periods. This is especially important (and most difficult) in remote, inaccessible areas where hot work is being done. Lack of adequate egress routes was cited in 5 incidents as a

contributory cause of injury or loss of life. Applicable Reports: JAGs 424-80, 4910-80, 2649-81, 1828-84, 4410-86.

7. Protective Clothing: During 7 fire incidents, fire fighting efforts were hampered by the lack of, or inadequate, protective clothing. Fire party members were not able to advance on some fires and were injured because they did not have proper protective clothing. Applicable Reports: JAGs 3840-79, 4910-80, 4382-80, 2858-81, 3909-83, 1395-84, 1828-84.

8. Steam Lines: High pressure, high temperature steam lines may pass through storage or fuel handling areas. In 5 incidents, degraded steam pipe lagging protection resulted in a hot surface ignition source. Inspection of the lagging and proper storage techniques would probably have prevented these fires. Applicable Reports: JAGs 5381-80, 0142-82, 1909-84, 3324-84, 3460-84.

9. Sprinkler System: Sprinkler protection of a space was cited in 6 cases as a potential means for lessening the fire severity and the amount of damage caused by a fire. Applicable Reports: JAGs 3840-79, 4382-80, 3575-81, 4745-81, 2247-83, 1828-84.

10. Portable Radio: Improvements to internal communication within a ship include the use of wireless portable radios. These radios had not been provided to all ships and was cited as a means for improving communication in 4 incidents. Applicable Reports: JAGs 5712-81, 5708-82, 3827-83, 5504-86.

11. Breathing Apparatus: Emergency Escape Breathing Devices (EEBD) or their predecessor Survival Support Devices (SSD) were used by personnel in the same manner as an Oxygen Breathing Apparatus (OBA), during 4 fire fighting operations. Although no major problems were experienced in these cases, the EEBD and SSD are not provided for this purpose. Applicable Reports: JAGs 946-82, 1828-84, 2528-84, 1626-86.

12. Lagging: Inadequate lagging of overhead decks, bulkheads and pipes contributed to the start and/or spread of 4 ship fires. Applicable Reports: JAGs 4382-80, 1909-84, 3460-84, 3960-85.

13. Fire Hose Maintenance: Fire hoses which failed (burst) during 2 ship fires were found to have delinquent hydrostatic testing. Applicable Reports: JAGs 2165-80, 1828-84.

14. IMC: Internal communications problems and confusion occurred because the IMC failed or was out of

service during 2 fire incidents. Applicable Reports: JAGs 3483-80, 4287-84.

15. Temporary Lighting: The use of proper, shatter-proof temporary lighting during ship repair procedures would have eliminated an ignition source and probably have prevented 2 ship fires. Applicable Reports: JAGs 4910-80, 0558-84.

16. OBA Amplifier: Communications difficulties were experienced in 2 incidents when personnel had donned OBAs. An OBA voice amplifier has been developed but is not available on all ships. Applicable Reports: JAGs 5712-81, 5708-82.

17. Self-Closing Doors: Smoke spread beyond the compartment of origin was attributed to defective self-closing doors (Ellison Doors) in 2 cases. Applicable Reports: JAGs 4410-86, 5504-86.

18. Temporary Ducting: In one major incident, fire was able to rapidly spread along temporary, combustible ventilation ducting (neoprene) which was being used during a repair period. Applicable Report: JAG 2649-81.

19. Pressurized Air: Ruptured pressurized air systems and tubing in a space can contribute to the intensity of the fire. This problem occurred more than once but it was only cited once as a lesson learned. Applicable Report: JAG 5504-86.

#### **MATRIX SUMMARY**

A detailed summary list of all unclassified JAG Summary Reports is contained in matrix form in Appendix F. This matrix was compiled to assist in locating and referencing particular JAG Reports. An explanation of the terminology and rationale used in compiling the list is also contained in Appendix F.

#### **GENERAL TRENDS AND SUMMARY**

This review was designed to gather and collate data on major Navy shipboard fires. A detailed statistical analysis is beyond the scope of the study, but it is useful to look at and summarize the data in general terms to identify relative trends. For this analysis, two categories of data are reviewed: situations which historically result in the most problems; and, recurring problems in fires with significant life or dollar loss. By looking at the data in these terms, the Navy may develop action items to reduce the overall

number of fires, and to improve fire protection/fire fighting to reduce the impact of fires.

## Recurring Lessons Learned

### Procedural/Personnel Related

The five most frequently cited issues are: improper storage of combustible and flammable materials; hot work; maintenance of equipment; space security; and training. The lessons learned from these recurring personnel-related issues show the importance of the human element and the wide gap between knowledge of the hazard and execution of the proper procedures. With a few particular exceptions, there is sufficient technical knowledge to address the problems. Although no direct comparison has been made with the previous study [1], there does not appear to have been any improvement in these areas, i.e., the same "people" related problems are repeated.

Improvements may only be effective if fundamental system changes are made. Several examples are pertinent:

1. Hot work, particularly during yard work, continues to be a major problem. Proper procedures are well known and documented. Closer supervision by trained personnel, especially during yard periods, is appropriate. This requires a commitment to watch procedures and, possibly, an increase in manpower to assure that adequate watches are maintained.
2. The training of personnel in fire fighting procedures and the use and maintenance of fire fighting equipment appears to need a general overhaul, as evidenced by:
  - . Continued problems with OBAs and other equipment;
  - . Problems with fire protection equipment during or just after maintenance; and
  - . Communication problems between on-scene and back-up personnel.

Team training (i.e., a dedicated crew from a specific ship) versus the practice of fire fighting proficiency evaluation, has potential for improving fire fighting proficiency. Alternatively, an instructor could be sent to individual ships to train crews, using realistic training techniques. These efforts, which could be applied to all areas related to fire protection and damage control, would require a revamped training system including restructured instructor training.

There should be an effort initiated to better understand the human element in the overall fire protection of ships. The output of this effort should be specific recommendations/action items to improve the transfer of technical knowledge to actual shipboard training, security, monitoring and maintenance practices. For example, a finding may be that all routine items related to fire protection, including maintenance of systems and fire prevention, be assigned to a small team of sailors whose sole responsibility is fire safety. More intensive and realistic training could be given to these sailors, who then would be responsible for on-board fire party training on a routine basis.

There is at least one area where a better technical understanding of the problem is required. From a design standpoint, it may be prudent to install fixed fire protection systems in storage areas other than those used for hazardous materials and flammable liquids.

#### Equipment/Design Related

The five most frequently cited issues related to equipment and design are: fire detection, cables, space ventilation, location of fire fighting equipment, and unsuccessful use of CO<sub>2</sub> extinguishers.

It became obvious during the review process that the parameters of the "Early Warning Detection" check-off were too broad and subject to considerable individual interpretation. In particular, it was difficult to assign a value to early warning detection when the loss was small. And, the loss alone cannot be used as the sole determining parameter; a loss may be high in expensive equipment where the fire is discovered immediately, but a detection system would have had no impact from a strict loss standpoint since the fire was discovered immediately. It may, however, be prudent to install early warning based on other factors, such as manning levels, impact on mission, total loss potential, replacement capability, etc. The net result of the Early Warning Detection check-off in this analysis was to err on the conservative side so that "yes" is frequently checked. A more rigorous risk assessment with less subjective criteria is required to better determine the need for early warning fire detection. Development of a risk assessment method similar to that being developed for storage space protection is recommended. In addition, an acceptable detector design must be developed which will not have the reliability and maintenance problems of other systems either tried or in use now.

Electrical cables continue to be a primary means of fire spread and development. New "low smoke" cabling



(MIL-C-24643) should reduce the contribution of electrical cables to fire spread and smoke production but it is not a panacea. On existing ships the problem remains. In fact, the cabling is only part (albeit a large part) of the overall issue of vertical and horizontal fire spread. Investigation into methods and strategies for limiting horizontal and vertical fire spread is needed, e.g., what is the priority for space protection/insulation, how long should a barrier remain and under what exposure, and can active fire protection systems supplement or replace passive systems. Improved cable protection may result from investigating: new generation cables, i.e., those that are on order of magnitude better than the new MIL SPEC cable; and, fire stopping methods for cable penetrations (work is in progress plus there is substantial data in the literature).

Space ventilation and the associated issue of smoke control is an area of considerable interest with few hard facts to substantiate any given strategy. Smoke control strategies for new ships should be developed. They should emphasize simplicity and capability in design, compatibility with other ship systems, successful integration with other ship fire safety systems, and flexibility to compensate for variations in anticipated ship and environmental effects. The first criterion is to establish a realistic expectation of system performance. Elaborate and complex designs usually create as many problems as they are intended to solve.

Developing smoke control concepts and hardware for new ships is not straightforward; application of smoke control techniques for existing ships will be even more difficult. It is probable that only the most basic and easily understood methods will be appropriate for existing ships. For example, NRL investigated venting of machinery spaces [2] and found optimum alignments with existing equipment. The strategies involve simple fan alignments for machinery space ventilation. Ventilation systems serving more geometrically complex spaces/compartments are much more difficult to align effectively. Perhaps existing ships should rely on other passive and active systems to limit fire growth. Portable equipment, such as smoke curtains and an improved portable blower, could supplement smoke control on existing ships.

The use and location of portable fire extinguishers should be evaluated in a systematic way. A research task is in progress to assess fire extinguisher effectiveness, placement and spacing requirements.

#### Trends in Large Loss Fires

A review of all ship fires resulting in loss of life or damage in excess of \$1 million was conducted to reveal any

common trends. There were eight fires involving loss of life and sixteen where the loss was greater than \$1 million. After looking at such items as fire class, compartment of fire origin, ignition source, arson and fire fighting equipment used, it became evident that there were no outstanding trends where attention could be focused. Generally, the large loss fires involved spaces which contained a significant amount of fuel, such as fuel oil in a machinery space or materials in a storage space. There were many different ignition sources and all of the fire fighting equipment and agents were used to some degree. To learn anything from these fires, a comprehensive, in-depth study is needed. Items to consider may not be within the context of a JAG investigation and will need to be determined from other sources. Such items include the level of fire party training, fire prevention procedures, overall ship fire protection design and others.

In addition, large loss fire data from pre-1980 fires should be examined to look for common trends and areas where the fire record has improved or worsened. Data from other Navies, such as the United Kingdom, France and Italy may also provide insight.

#### DEFINITIONS AND ABBREVIATIONS

Additional definitions and abbreviations used in the JAG Reports are contained in Appendix G. This section is provided to clarify the numerous acronyms and jargon found in the reports. A description of the space designation lettering system is also provided.

#### REFERENCES

1. J.B. Ferguson, "Review of Judge Advocate General Fire Investigation Reports for Naval Surface Ships for 1960 to 1979," W2142.2, Rolf Jensen and Associates, Inc., April 1981.
2. J.T. Leonard and P.J. DiNenno, "Full Scale Tests of Machinery Space Class B Fires and Ventilation System Configuration," NRL Memorandum Report (in preparation), Nov 1986.

APPENDIX A

LIST OF REVIEWED JAG REPORTS 1980-1987

# LIST OF REVIEWED JAG REPORTS 1980-1987

## 1979 (Missing from previous review)

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	2825-79	Saratoga	CV60	Sprinkler Activation	5 Jan 79
2.	3840-79	JF Kennedy	CV67	Four Arson Fires	9 Apr 79
3.	6460-79	DD Eisenhower	CV69	Fire in Shaft Alley	14 Jan 79

## 1980

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	424-80	Coronado	LPD11	Class C Fire in Switchboard	16 Mar 79
2.	438-80	Shenandoah	AD26	Fire in Paint Room	19 May 79
3.	626-80	Conyngham	DDG 17	Four Arson Fires	12-14 Jul 78
4.	920-80	Paul Revere	LPA248	Arson Fire in Passageway	1 May 79
5.	993-80	Manley	DD940	Fuel Oil Fire	8 Apr 79
6.	1542-80	Independence	CV62	Fire in Pump Room	9 Jun 79
7.	1831-80	Savannah	AOR4	Fire in Passageway	27 Nov 79
8.	2165-80	Bradley	FF1041	Fire in Storeroom	8 Nov 79
9.	2319-80	Turner Joy	DD951	Fire in Engineering	8 Nov 79
10.	3295-80	Anchorage	LSD36	Fire in Berthing	4 Dec 79
11.	3438-80	White Plains	AF54	Electrical Fire	19 Nov 79
12.	4162-80	Whipple	FF1062	Explosion and Fire	21 Jan 80
13.	4244-80	Barry	DD933	Fire in CIC	25 Apr 80
14.	4382-80	Iwo Jima	LPH2	Arson Fire in Berthing	3 Jul 79
15.	4389-80 & 5029-84	Truckee	TAO147	Fire in Pumproom	7 Aug 80
16.	4910-80	McCloy	FF1038	Fire in Chain Locker	16 Oct 79
17.	5360-80	Iwo Jima	LPH2	Fire in Trash Can	31 Mar 80
18.	5364-80	WH Standlee	CG32	Boiler Explosion - No Fire	3 Mar 80
19.	5381-80	Independence	CV62	Fire in Storage Room	19-20 Jun 80
20.	5437-80	Davidson	FF1045	Spray Fire	17 Jun 80

## 1981

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	883-81	California	CGN36	Fire in Berthing	4 Dec 79
2.	1025-81	Saratoga	CV60	Fire in Berthing	21 Oct 79
3.	1139-81	Horne	CG30	Fire in Galley	10 Sept 80
4.	2595-81	King	DDG41	Fire in Storeroom	20 Apr 80

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
5.	2649-81	Spruance	DD963	Fire near Sonar Dome	4 Oct 80
6.	2858-81	(None)	YBN1177	Fire on Barge	14 Feb 81
7.	3563-81	Haleakala	AE25	Boiler Explosion - No Fire	5 Dec 80
8.	3575-81	Okinawa	LPH3	Fire in Storeroom	30 Sept 80
9.	4009-81	Dyess		No Fire	23 Sept 80
10.	4042-81	Somers	DDG34	Boiler Explosion - No Fire	14 Aug 80
11.	4609-81	RL Page	FFG7	Flooding - No Fire	30 May 81
12.	4745-81	Okinawa	LPH3	Fire in AV Storeroom	21 Feb 81
13.	4940-81	LY Speer	AS36	Fire in Foundry	21 Apr 81
14.	5131-81	Nimitz	CVN68	Fire at Fueling Station	23 Dec 80
15.	5322-81	MacDonough	DDG39	Oil Overflow - No Fire	8 Sept 81
16.	5366-81	Downes	FF1070	Boiler Flareback - No Fire	8 Feb 81
17.	5375-81	Puget Sound	AD38	Fire on Flight Deck	2 Nov 80
18.	5712-81	Enterprise	CVN65	Fire in Void	1 Jun 81
19.	6174-81	Guam	LPH9	Helo Crash and Fire	19 Jul 81
20.	6704-81	O'Brien	DD975	Steam Leak - No Fire	26 Aug 81
21.	6728-81	Kansas City	AOR3	Boiler Explosion - No Fire	14 Aug 81
22.	6816-81	Turner Joy	DD951	No Fire	18 Feb 81
23.	6868-81	Aylwin	FF1081	Fire in CIC	4 Apr 81

1982

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0064-82	Guam	LPH9	Fire in Berthing	27 Jan 82
2.	0142-82	Independence	CV62	Fire in Cat Pipe Space	18 Jul 81
3.	0366-82	Brooke	FFG1	Flooding - No Fire	31 Jul 81
4.	0374-82	O'Callahan	FF1051	Overheated Transformers	25 Jan 81
5.	0623-82	Boulder	LST1190	Fire in Storeroom	11 Oct 81
6.	0756-82	Fanning	FF1076	Fire in Stateroom	15 Feb 81
7.	0923-82	Ouellet	FF1077	Fire in Storeroom	24 Sept 81
8.	0946-82	America	CV66	Fire in Cat Piping Trunk	23 Sept 81
9.	1298-82	Savannah	AOR4	Fire in Dry Dock	15 May 81
10.	1385-82	Independence	CV62	Fire in AirOps	15 Aug 81
11.	1464-82	Savannah	AOR4	Fire in Fireroom	25 Jun 81
12.	1476-82	Nitro	AE23	Spray Fire	1 Jun 81
13.	1569-82	Halekala	AE25	Fire in Storeroom	5 Sept 81
14.	1907-82	Milwaukee	AOR2	No Fire	29 May 81
15.	2280-82	Independence	CV62	Fire in Shop	20 Jan 82
16.	2345-82	McInerney	FFG8	Fire in Storeroom	22 Mar 82
17.	2464-82	Mt Whitney	LCC20	Fire in Storeroom	18 Feb 82
18.	2564-82	Clark	FFG11	Fire in SSDG	29 Oct 81

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
19.	2584-82	Inchon	LPH12	Boiler Explosion - No Fire	7 Oct 81
20.	2657-82	(None)	YTB766	No Fire	16 Dec 81
21.	3194-82	Nimitz	CVN68	Crash on Flight Deck	26-27 May 81
22.	3234-82	E. McDonnell	FF1043	No Fire	10 Feb 82
23.	3595-82	Pensacola	LSD38	Fire in Switchboard	6 Nov 81
24.	3610-82	Nimitz	CVN68	Fire in Fan Room	1 Oct 81
25.	3809-82	Guam	LPH9	Fire in Storeroom	17 Feb 82
26.	3962-82	Biddle	CG34	No Fire	2 Mar 82
27.	4046-82	McInerney	FFG8	Fire in 400Hz Room	10 Apr 82
28.	4064-82	Jos. Daniels	CG27	Activation of Sprinkler	9 Jul 81
29.	4067-82	Guam	LPH9	Fire in Storeroom	4 Apr 82
30.	4381-82	Juneau	LPD10	Explosion in Tank	12 Mar 82
31.	4427-82	Coral Sea	CV43	Fire in CIC	24 Jun 82
32.	4991-82	San Diego	AF56	Activation of Sprinklers	16 Apr 82
33.	5358-82	JP Jones	DDG32	Fire in Void	21 Oct 80
34.	5586-82	Blakely	FF1072	Fire in Windlass Room	22 Jan 82
35.	5662-82	England	CG22	Boiler Explosion - No Fire	30 Jun 82
36.	5708-82	Ranger	CV61	Two Fires	5-6 Aug 81
37.	5709-82	Patterson	FF1061	Flooding by Sprinklers	14 Jun 81
38.	5717-82	Sylvania	AF52	Fire in Office	9 Aug 82
39.	5738-82	Vulcan	AR5	Accidental CO <sub>2</sub> Discharge	29 Apr 82

1983

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0071-83	Hunley	AS31	Explosion and Fire in Engine	12 Jan 82
2.	0097-83	Mount Hood	AE29	No Fire	29 Oct 81
3.	0104-83	Virginia	CGN38	Activation of Sprinklers	6 Jul 82
4.	0501-83	Somers	DDG34	Boiler Explosion - No Fire	12 Sept 82
5.	0868-83	Vulcan	AR5	Accidental CO <sub>2</sub> Discharge	27 May 82
6.	1088-83	Bradley	FF1041	Flooding by Sprinklers	21 Mar 82
7.	1232-83	Tarawa	LHA1	Oven Fire	14 May 82
8.	1302-83	JA Moore	FFG19	No Fire	17 May 82
9.	1510-83	CV Ricketts	DDG5	Fire in Elect. Equip.	19 Aug 82
10.	1783-83	Harlan County	LST1169	Fire in Switchboard	5 Dec 82
11.	1784-83	J Rodgers	DD983	Fire in Aux. Mach. Space	20 Jun 82
12.	1792-83	Norton Sound	AVM1	Flooding - No Fire	26 Oct 82
13.	2110-83	RL Page	FFG5	No Fire - Tank Rupture	22 Sept 82
14.	2247-83	JF Kennedy	CV67	Fire in Storage Space	18-19 Jan 83

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
15.	2316-83	Newport	LST1179	Bilge Fire in Engineroom	18 Mar 82
16.	2744-83	Taluga	TAO62	Spray Fire	3 Apr 81
17.	2977-83 & 1967-83	Shreveport	LPD12	Fire in Trash Burner Room	30 Jan 83
18.	3135-83	America	CV66	Arson Fire	1 Aug 82
19.	3228-83	Oldendorf	DD972	Spray Fire	10 Aug 82
20.	3257-83	Sydney	FFG35	Arson Fire	24 Jan 82
21.	3339-83	Dubuque	LPD8	Fire in Machinery Room	23 Oct 82
22.	3363-83	Seattle	AOE3	Explosion and Fire in Storage	13 Jul 82
23.	3403-83	Ponce	LPD15	Fire in Vehicle Storage	25 Feb 83
24.	3404-83	Jos. Daniels	CG27	Fire in IC Storage	14 Feb 83
25.	3615-83	Constellation	CV64	Fire in Tool Room	5 Jun 83
26.	3734-83	Camden	AOE2	Boiler Explosion - No Fire	4 Oct 82
27.	3827-83	Independence	CVN62	Arson in Wardroom	29 May 82
28.	3909-83	Iwo Jima	LPH2	Fire in Locker	30 Jan 82
29.	3923-83	Gridley	CG21	Fire in SES	22 Apr 83
30.	4062-83	Sunbird	ASR15	Fire in Stateroom	17 May 83
31.	4073-83	San Diego	AFS6	Fire in Incinerator Room	4 Jan 83
32.	4133-83	David R. Ray	DD971	Sprinkler Flooding	22 Mar 83
33.	4142-83	Glover	FF1098	Boiler Casualty	15 Nov 82
34.	4556-83	Bradley	FF1041	Flooding - No Fire	9 Jun 82
35.	4632-83	Blue Ridge	LCC19	Fire in Storeroom	27 May 83
36.	4651-83	Butte	AE27	No Fire	2 Feb 83
37.	4893-83	Virginia	CGN38	Sprinkler Activation	27 Mar 83
38.	5066-83	JF Kennedy	CV67	Fire in Cat Piping Spaces	12 Aug 83

1984

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0220-84	Hull	DD945	Fire in Uptake Trunk	1 Mar 83
2.	0226-84	Hermitage	LSD34	Fire in Storeroom	10 Sept 84
3.	0511-84	Ramsey	FFG2	Sprinkler Activation	31 Jan 83
4.	0558-84	Dubuque	LPD8	Fire in Fuel Tank	15 Apr 83
5.	0585-84	Saugus	YTB780	Fire in Engine Room	17 Jun 83
6.	0806-84	Belleau Wood	LHA3	Fire in Storeroom	7 Dec 82
7.	1258-84	Farragut	DDG37	Fire in Office	16 Sept 83
8.	1344-84	Hermitage	LSD34	Fire in Shop	7 Oct 83
9.	1395-84	Coral Sea	CV43	Fire in Fireroom	17 Dec 83
10.	1421-84	Reeves	CG24	Fire in Switchboard	13 Sept 83
11.	1819-84	Bowditch	TAGS21	No Fire	12 Jan 84
12.	1828-84	Ranger	CV61	Spray Fire	1 Nov 83

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
13.	1832-84	Oak Ridge	ARDM1	Boiler Explosion - No Fire	23 23 Jan 83
14.	1909-84	Independence	CV62	Fire in Cat. Void	8 Sept 83
15.	2003-84	Davidson	FF1045	Fire in Office	10 Aug 83
16.	2199-84	Nashville	LPD13	Sprinkler Flooding	3 Jan 84
17.	2264-84	G Philip	FFG12	Fire in #4 SSDG	27 May 83
18.	2434-84	Fidelity	MSO443	Fire in Generator	17 Oct 83
19.	2528-84	Tattnall	DDG19	Cable Fire in Fireroom	18 Jan 84
20.	2630-84	Suribachi	AE21	Fire in SSTG	26 Jan 84
21.	2733-84	Peleliu	LHA5	Three Fires	27-28 Aug 83
22.	3319-84	Hunley	AS31	Fire in Storeroom	2 Oct 83
23.	3324-84	Kitty Hawk	CV63	Fire in Storeroom	6 Apr 84
24.	3337-84	Midway	CV41	Fire in Berthing	19 Dec 83
25.	3460-84	Constellation	CV64	Fire in Storeroom	11 Mar 84
26.	3467-84	Kiska	AE35	Fire in Generator	12 Jun 84
27.	3789-84	Stump	DDG78	Sprinkler Activation	20 May 84
28.	4187-84	Papago	ATF160	Fire in Switchboard	14 May 84
29.	4287-84	Ranger	CV61	Fire in GSK Storeroom	10 Mar 84
30.	4481-84	(None)	YTB821	No Fire	20 Mar 84
31.	4603-84	Tripoli	LPH10	Fire in GSK Storeroom	30 Apr 84
32.	4716-84	Merrimack	AO179	Helo Crash and Fire	30 Dec 83

1985

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0012-85	Iwo Jima	LPH2	Sprinkler Activation	1 Aug 84
2.	0127-85	Monongahela	AO178	Halon 1301 Discharge	11 Sept 84
3.	0133-85	Koelsch	FF1049	Fire in Berthing	15 Jun 84
4.	0378-85	Enterprise	CVN65	Fire in Office Area	31 May 84
5.	0414-85	Ticonderoga	CG47	Fire in Uptake Trunk	8 Sept 84
6.	0663-85	Fortify	MSO446	Fire in Switchboard	24 Aug 84
7.	0664-85	Iowa	BB61	Fire in Switchboard	4 Nov 84
8.	1211-85	CF Adams	DDG2	Fire in Storeroom	15 Aug 84
9.	1317-85	Barbour County	LST1195	Fire in Locker	1 Jun 84
10.	2178-85	(None)	YTM252	Engine Explosion - No Fire	30 Jan 85
11.	2237-85	Keokuk	YTB771	Fire in Stack	5 Sept 84
12.	2447-85	Turtle	DSV3	Fire on a DSV	16 Aug 84
13.	2742-85	Knox	FF1052	Fire in Switchboard	13 Jul 84
14.	2940-85	Saipan	LHA2	Fire in Storage Area	3 Aug 84
15.	3156-85	Kalamazoo	AOR6	Sprinkler Activation	13 Mar 85
16.	3194-85	Merrimack	AO179	Fire in Berthing	12 Mar 85
17.	3197-85	Moinester	FF1097	Fire in Overhead	16 Jan 85
18.	3212-85	Concord	AFS5	Fire on Main Deck	16 Jan 85
19.	3296-85	(None)	IX506	Fire in Switchboard	25 Apr 85
20.	3354-85	WS Simms	FF1059	Fire in Machine Room	14 Dec 84
21.	3623-85	S. Gompers	AD37	Fire in Circuit Breaker	15 Apr 85
22.	3674-85	Concord	AFS5	Fire in Storeroom	12 Jan 85



	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
23.	3781-85	Merrimack	AO179	Fire in Control Room	31 Mar 85
24.	3960-85	Illusive	MSO448	Fire in Engine Room	16 Feb 85
25.	4296-85	Biddle	CG34	Fire in Flam. Liq. Storeroom	20 Jan 85
26.	4325-85	Ponce	LPD15	Fire in Stateroom	18 Apr 85
27.	4372-85	E Montgomery	FF1082	Fire in Helo Hangar	20 Dec 84
28.	4391-85	Ingersoll	DD990	Fire in JP5 Pumproom	17 Jan 85
29.	4396-85	Merrimack	AO179	Arson Fire in Control Room	31 May 85
30.	4482-85	Inflict	MSO456	Small Fire in Jacking Gear	10 Jun 85
31.	4529-85	Leader	MSO490	Fire in Generator	21 Dec 84
32.	4620-85	Blue Ridge	LCC19	Fire in Trash Burner Room	10 Jun 85

1986

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0218-86	Luce	DDG38	Fire in Storeroom	2 Jun 85
2.	0256-86	Mont Hood	AE29	Fire in Storeroom	15 Oct 85
3.	0428-86	Monongahela	AO178	AFFF Discharge	5 Oct 85
4.	0533-86	Fahrion	FFG22	Fire in SFC	26 Aug 85
5.	0602-86	Portland	LSD37	Three Arson Fires	9 Aug 85
6.	0699-86	Saipan	LHA2	Fire/Explosion in Shop Oven	27 Aug 85
7.	0701-86	Iowa	BB61	PKP Discharge	18 Nov 85
8.	1466-86	LY Spear	AS36	Fire in Gig-Whaleboat	21 Oct 85
9.	1516-86	Harlan County	LST1196	Cable Fire in Engine Room	17 Sept 85
10.	1534-86	Fahrion	FFG22	Fire in Converter Room	21 Oct 85
11.	1626-86	Portland	LSD37	Fire in Berthing	6 Oct 85
12.	1634-86	Monongahela	AO178	Fire in Deck Locker	16 Dec 85
13.	1815-86	HE Yarnell	CG17	Fire in Storeroom	4 Dec 85
14.	1858-86	DD Eisenhower	CVN69	Fire in Storage Space	21 Feb 86
15.	2119-86	Patterson	FF1061	Fire Behind the Stack	18 Dec 85
16.	2194-86	Iowa	BB61	Fire in Storeroom	11 Feb 86
17.	2196-86	Platte	AO186	Fire in Flam. Liq. Issue Room	2 May 86
18.	2884-86	Zeus	T-ARC7	Boiler Explosion - No Fire	21 May 85
19.	3136-86	America	CV66	Fire in Electrical Load Center	3 Mar 85
20.	3362-86	Fahrion	FFG22	Electrical Equipment Fire	20 Dec 85
21.	4135-86	Pigeon	ASR21	Diesel Generator Failure	6 May 86
22.	4364-86	Camden	AOE2	Fire in Switchboard	31 Oct 85
23.	4410-86	Spica	T-AFS9	Fire in Engine Room	26 Sept 85

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
24.	4591-86	Concord	AFS5	Fire in Berthing Head	20 Oct 85
25.	4593-86	Shenandoah	AD44	No Fire	14 Jun 85
26.	4597-86	Stump	DD978	Fire in Flam. Liquid Storeroom	12 May 85
27.	4599-86	Ponce	LPD15	Fire in Forklift	9 Oct 85
28.	4648-86	Jos. Daniels	CG27	Fire in #2 Main Engine	21 Apr 86
29.	4655-86	Proteus	AS19	Fire in Captain's Gig	16 Apr 86
30.	4893-86	DD Eisenhower	CVN69	Fire in Storeroom	20 Mar 86
31.	5036-86	Dale	CG19	Fire in MG Room	3 Nov 85
32.	5302-86	Inflict	MSO456	PKP Discharge	27 Jun 86
33.	5326-86	Proteus	AS19	Crankcase Explosion	22 Oct 85
34.	5504-86	Schenectady	LST1185	Spray Fire	6 May 86

1987

	<u>JAG #</u>	<u>Ship Name</u>	<u>Hull #</u>	<u>Incident</u>	<u>Incident Date</u>
1.	0245-87	Iowa	BB61	No Fire	6 Aug 86
2.	1630-87	Mississippi	CGN30	Fire in Storeroom	14 Oct 86

APPENDIX B

LIST OF JAG REPORTS NOT AVAILABLE FOR REVIEW

# LIST OF JAG REPORTS NOT AVAILABLE FOR REVIEW

<u>JAG NO.</u>	<u>SHIP NAME</u>	<u>INCIDENT DATE</u>
1. 3863-80	USS Lexington	1/17/80
2. 540-80	USS Kitty Hawk	6/25/79
3. 1670-80	USS Midway	8/9/79
4. 2913-80	USS Saratoga	1/23/80
5. 3492-80	USS Guam	3/25/79
6. 4203-80	USS Enterprise	6/20/79
7. 2344-80	USS Shasta	5/1/80
8. 3009-81	USS Biddle	8/21/79
9. 1260-82	USS Bowen	8/30/81
10. 3288-82	USS California	12/17/81
11. 4564-81	(No Name)	4/15/81
12. 5666-82	USS England	6/30/82
13. 6090-81	USS Jouell	4/6/81
14. 3384-82	USS Kennedy	11/26/81
15. 742-82	USS Mississippi	5/19/81
16. 3642-81	USS Schofield	6/4/80
17. 2004-82	USS F. Sherman	11/17/81
18. 441-81	USS Somers	8/14/80
19. 1570-82	USS South Carolina	4/1/82
20. 4022-81	USS Tattnall	9/1/80
21. 4096-83	USS Arkansas	2/7/83
22. (Unknown)	USS Doyle	3/27/85
23. 3155-83	USS Garcia	4/19/82
24. (Unknown)	USS J.P. Jones	10/21/80
25. (Unknown)	USNB Jupiter	1/19/83
26. 0614-83	USS Morton	3/5/81
27. (Unknown)	USS Ponce	4/15/85
28. 1653-85	USS Thach	7/22/84
29. 2590-84	USS Waddell	12/5/83
30. 2529-86	USS Roosevelt	11/16/85
31. 4396-85	USS Merrimack	4/31/85
32. 3896-86	USS Canisteo	9/9/85
33. 171-86	USS Sunbird	7/25/85
34. 9244-86 (INO)*	USS Simon Lake	7/6/85
35. 1429-86	USS Halsey	12/17/85
36. 5514-86 (INO)*	USS W.H. Standley	5/5/86
37. 10557-86 (INO)*	USS King	8/26/87
38. 0061-86	USS Doyle	3/27/85
39. 4599-86	USS Ponce	10/9/85
40. 4637-86	USS Dubuque	4/15/83
41. 10690-86 (INO)*	USNS HassayampAn	7/18/86
42. 10354-86 (INO)*	(No Name)	9/5/86

\* JAG Investigation Number (INO) - report in progress, no JAG No. assigned.

<u>JAG NO.</u>	<u>SHIP NAME</u>	<u>INCIDENT DATE</u>
43. 1451-86	SS Letitia Lykes	5/8/85
44. 2744-83	USNS Taluga	4/3/81
45. 2199-84	USS Nashville	1/3/84
46. 4087-85	USS Guadalcanal	6/3/85
47. 2741-85	USS Constellation	8/7/84
48. 0126-85	USS Monogahelia	9/15/84
49. 1688-86	USS Biddle	12/23/85
50. 4776-85	USS Koelsch	1/15/85
51. 4789-85	USS America	7/13/85
52. 2588-84	USS Thorne	
53. 2476-83	N/A	
54. 1188-84	N/A	
55. 0221-81	N/A	
56. 1599-83	Witz	8/4/82
57. 4086-83	USS Kincaid	12/11/82
58. 4815-84	USS Vogue	8/17/84
59. 4693-85	USS Barbey	6/27/85
60. 2627-86	USS Fife	9/1/85
61. 1480-86	USS Kitty Hawk	10/30/85
62. 5523-86	USS Midway	7/10/85
63. 2681-86	USS Enterprise	3/8/86
64. 4823-85	USS Midway	7/13/85
65. 2782-87	USS Carl Vinson	12/29/86
66. 5702-86	USS Carl Vinson	7/18/86
67. 3138-86	USS Guadalcanal	3/9/86
68. 0879-86	USS Iwo Jima	8/12/85
69. 0174-86	USS Midway	8/17/85
70. 5432-86	USS Constellation	3/12/86
71. 0615-86	USS Coral Sea	10/20/85
72. 5653-86	USS Underwood	6/9/86
73. 1434-86	USS Halyburton	9/11/85
74. 6165-80	USS Saratoga	
75. 2657-81	YTB 766	12/16/81
76. 0065-82	USS Dahlgren	6/29/81
77. 4591-85	USS Concord	10/20/85
78. 5072-79	USS Piedmont	

APPENDIX C

SUBMARINE FIRE INCIDENTS

## SUBMARINE FIRE INCIDENTS

A total of six submarine fire incident JAG Reports were identified and summarized. An additional seventh, classified, incident is included with the other classified reports. A cross reference matrix is provided with the submarine reports.

All of the fires included here resulted in minor damage and were easily handled by the ship's force. Fires aboard submarines are infrequent and there were no common or recurring lessons learned from these 6 incidents.

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 2534-81 DATE 25 May 80SHIP NAME USS George Bancroft SHIP# SSBN 643LOCATION 1. AT SEA \_\_\_\_\_  
2. MOORED XPortsmouth Naval Shipyard, VA

## I. THE FIRE/CAUSE

Fire in missile compartment of submarineA. CLASS OF FIRE A. X B. \_\_\_\_\_ C. \_\_\_\_\_ D. \_\_\_\_\_B. ALARM TRANSMITTED 1735 DECLARED OUT 1752 DURATION 17 min

C. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # \_\_\_\_\_

DESCRIPTION Missile Compartment

## D. SOURCE OF HEAT OF IGNITION

1. ELECTRICAL	_____	7. OPEN FLAME/WELDING	_____
2. EXPLOSION	_____	8. MECHANICAL FAILURE/ FRICTION	_____
3. COOKING	_____	9. SPONTAN. COMBUSTION	_____
4. ENEMY ACTION	_____	10. HEATING APPLIANCES	_____
5. HOT SURFACES	_____	11. OTHER (SPECIFY)	_____
6. MATCHES/SMOKING <u>X - Arson</u>			

## E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)

1. GAS	_____	3. EXPLOS./INCEND.	_____
2. FL./LIQ.	_____	4. ORDINARY COMB.	<u>Paper</u> <u>wrappings</u>
5. ARSON/SUSPICIOUS?	<u>Yes</u>		

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. Smoke coming from boat was discovered topside by personnel who went below and found more smoke billowing from doorway leading to missile room.
2. Word of fire passed on 4MC
3. Shortly after 1735 "Fire in missile compartment" passed over 1MC.
4. General alarm sounded at 1740.
5. Shipyard Fire Department called at 1742.



JAG # 2534-81

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

## A. MEANS FOR SPREAD

- |                          |       |                      |       |
|--------------------------|-------|----------------------|-------|
| 1. HOLE IN DECK/BULKHEAD | _____ | 5. FLAMMABLE LIQUID  | _____ |
| 2. CONDUCTION THROUGH    | _____ | FLOW                 | _____ |
| DECK/BULKHEAD            | _____ | 6. WIND              | _____ |
| 3. EXPLOSION             | _____ | 7. ELECTRICAL CABLES | _____ |
| 4. VENT DUCTS            | _____ | 8. OTHER (SPECIFY)   | _____ |

## B. MATERIALS INVOLVED IN SPREAD

- |             |       |                    |                             |
|-------------|-------|--------------------|-----------------------------|
| 1. GAS      | _____ | 3. EXPLOS./INCEND. | _____                       |
| 2. FL./LIQ. | _____ | 4. ORDINARY COMB.  | <u>X</u> - Electronic parts |

## C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

1. Arson
2. Accumulation of combustible materials

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESS

1. Fire fighting efforts hampered by problems with EABs. Personnel were unfamiliar with their use and a number of EAB were defective.
2. Fire fighting efforts were disorganized due to a delay in establishing command.
3. Communication between Damage Control and missile compartment was sporadic and unreliable.

WOULD EARLY WARNING HAVE MITIGATED THE LOSS?

X\* YES      \_\_\_\_\_ NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

\* Delay in detecting fire

JAG # 2534-81

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED

- |                    |               |                    |               |
|--------------------|---------------|--------------------|---------------|
| 1. WATER/FOG       | <u>X</u>      | 5. PROTEIN FOAM    | <u>      </u> |
| 2. PKP             | <u>X</u>      | 6. HALON           | <u>      </u> |
| 3. AFFF            | <u>      </u> | 7. OTHER (SPECIFY) | <u>Dry</u>    |
| 4. CO <sub>2</sub> | <u>X</u>      |                    | <u>powder</u> |
|                    | Hoseline      |                    |               |

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

- |                    |               |
|--------------------|---------------|
| 1. SPRINKLERS      | <u>      </u> |
| 2. GASEOUS SYSTEMS | <u>      </u> |
| 3. WATER HOSELINES | <u>X</u>      |
| 4. PKP/AFFF        | <u>      </u> |

## PORTABLE EQUIPMENT

- |                    |                       |
|--------------------|-----------------------|
| 1. EXTINGUISHERS   | <u>CO<sub>2</sub></u> |
|                    | <u>PKP &amp; DC</u>   |
| 2. PUMPS           | <u>      </u>         |
| 3. FOAM            | <u>      </u>         |
| 4. OBA'S and EAB'S | <u>X</u>              |

## C. ACTIONS TO VENT?

- |                     |               |                        |               |
|---------------------|---------------|------------------------|---------------|
| 1. MECH. VENT DUCTS | <u>X</u>      | 1. NATURAL VENTILATION | <u>      </u> |
| 2. PORTABLE BLOWERS | <u>      </u> | 2. OTHER (SPECIFY)     | <u>      </u> |

## D. FIRE FIGHTING ORGANIZATIONS

- |                  |                                       |
|------------------|---------------------------------------|
| 1. SHIP'S FORCE  | <u>X</u>                              |
| 2. SHORE BASED - | <u>NAVY</u>                           |
|                  | <u>MUNICIPAL</u>                      |
| 3. OTHER SHIPS   | <u>X Portsmouth Naval Shipyard FD</u> |

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Missile compartment

- |                        |                       |                         |               |
|------------------------|-----------------------|-------------------------|---------------|
| B. DIRECT COST OF FIRE | <u>\$65-\$100,000</u> | C. OPERATING DAYS LOST  | <u>      </u> |
| D. REPAIR MAN-HOURS    | <u>      </u>         | E. LOSS OF LIFE         | <u>      </u> |
| F. PERSONAL INJURY     | <u>8-Smoke inhal.</u> | G. DAMAGED              | <u>      </u> |
|                        |                       | Missile tube electrical |               |
|                        |                       | and mechanical support  |               |
|                        |                       | systems, spare parts    |               |

JAG # 2534-81

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. Smoke discovered coming from missile compartment at 1733.
2. Fire alarm passed over 4MC and 1MC.
3. Shipyard Fire Department called at 1742 by the barge.
4. Word was passed over 1MC that "fire is out" when in fact it was not.
5. Some personnel donned EABs, some did not.
6. Fire Department arrived with a 1000 GPM pumper, a CO<sub>2</sub> truck, and fire and flooding equipped van.
7. Fire hoses rigged from barge to ship.
8. CO<sub>2</sub> extinguisher discharged into the compartment. Too much smoke prevented location of the fire.
9. Fire fighters with CO<sub>2</sub> hand line and air pacs entered ship. More CO<sub>2</sub> extinguishers passed down to the missile compartment.
10. Numerous personnel had problems with EABs.
11. Fire found and extinguished with CO<sub>2</sub> extinguisher. Water hose line was used once briefly.
12. Desmoking was begun at 1752.

B. LESSONS LEARNED

1. JAGMAN: "Training on use of OBA and EAB should be conducted more frequently. Emphasis on the necessity of respiratory protection at all times in a toxic atmosphere."
2. JAGMAN: "Improve damage control gear maintenance organization."
3. JAGMAN: "Reliable uninterrupted communication between Damage Control and fire area must be maintained at all times."
4. HAI: Early warning/detection would minimize the delay in detecting and locating this fire.

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 5354-83 DATE 6 Jul 83  
 SHIP NAME USS George Washington Carver SHIP# SSBN-656  
 LOCATION 1. AT SEA \_\_\_\_\_  
 2. MOORED X Drydock #4 \_\_\_\_\_  
Newport News, VA

## I. THE FIRE/CAUSE

Fire in Engine Room Escape Trunk

- A. CLASS OF FIRE A. \_\_\_\_\_ B. \_\_\_\_\_ C. X D. \_\_\_\_\_  
 B. ALARM TRANSMITTED 1815 DECLARED OUT 1820 DURATION 5 min  
 C. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # \_\_\_\_\_  
 DESCRIPTION Engine Room  
 D. SOURCE OF HEAT OF IGNITION  
 1. ELECTRICAL Arc 7. OPEN FLAME/WELDING \_\_\_\_\_  
 2. EXPLOSION \_\_\_\_\_ 8. MECHANICAL FAILURE/  
 3. COOKING \_\_\_\_\_ FRICTION \_\_\_\_\_  
 4. ENEMY ACTION \_\_\_\_\_ 9. SPONTAN. COMBUSTION \_\_\_\_\_  
 5. HOT SURFACES \_\_\_\_\_ 10. HEATING APPLIANCES \_\_\_\_\_  
 6. MATCHES/SMOKING \_\_\_\_\_ 11. OTHER (SPECIFY) \_\_\_\_\_  
 E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY) \*  
 1. GAS \_\_\_\_\_ 3. EXPLOS./INCEND. \_\_\_\_\_  
 2. FL./LIQ. \_\_\_\_\_ 4. ORDINARY COMB. \_\_\_\_\_  
 5. ARSON/SUSPICIOUS? No

\* No sustained burning resulted from the electric arc.

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. At 1814 motor generator testing was commenced and when port TG bus was energized a loud explosion (electric arc) was heard from engine room escape trunk.  
 2. Fire was announced over 4MC at 1815.

JAG # 5354-83

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

## A. MEANS FOR SPREAD

- |                          |       |                      |       |
|--------------------------|-------|----------------------|-------|
| 1. HOLE IN DECK/BULKHEAD | _____ | 5. FLAMMABLE LIQUID  | _____ |
| 2. CONDUCTION THROUGH    | _____ | FLOW                 | _____ |
| DECK/BULKHEAD            | _____ | 6. WIND              | _____ |
| 3. EXPLOSION             | _____ | 7. ELECTRICAL CABLES | _____ |
| 4. VENT DUCTS            | _____ | 8. OTHER (SPECIFY)   | _____ |

## B. MATERIALS INVOLVED IN SPREAD

- |             |       |                    |       |
|-------------|-------|--------------------|-------|
| 1. GAS      | _____ | 3. EXPLOS./INCEND. | _____ |
| 2. FL./LIQ. | _____ | 4. ORDINARY COMB.  | _____ |

## C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

1. Poor judgment and improper procedures used during testing.
2. Failure to properly tag an open tie breaker resulted in a closed circuit which was thought to be open.

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESSWOULD EARLY WARNING HAVE MITIGATED THE LOSS?

\_\_\_\_\_ YES      X NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

JAG # 5354-83

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED

1. WATER/FOG	_____	5. PROTEIN FOAM	_____
2. PKP	_____	6. HALON	_____
3. AFFF	_____	7. OTHER (SPECIFY)	_____
4. CO <sub>2</sub>	<u>X</u>		

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

## PORTABLE EQUIPMENT

1. SPRINKLERS	_____	1. EXTINGUISHERS	<u>CO<sub>2</sub></u>
2. GASEOUS SYSTEMS	_____	2. PUMPS	_____
3. WATER HOSELINES	_____	3. FOAM	_____
4. PKP/AFFF	_____	4. OBA'S	_____

## C. ACTIONS TO VENT?

1. MECH. VENT DUCTS	_____	1. NATURAL VENTILATION	_____
2. PORTABLE BLOWERS	_____	2. OTHER (SPECIFY)	_____

## D. FIRE FIGHTING ORGANIZATIONS

1. SHIP'S FORCE	<u>X</u>
2. SHORE BASED -	NAVY _____
	MUNICIPAL _____
3. OTHER SHIPS	_____

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Engine room escape trunk

B. DIRECT COST OF FIRE	<u>Minimal</u>	C. OPERATING DAYS LOST	_____
D. REPAIR MAN-HOURS	_____	E. LOSS OF LIFE	_____
F. PERSONAL INJURY	<u>0</u>	G. DAMAGED	<u>*</u>

\* Minor to escape trunk

JAG # 5354-83

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. During the testing of port motor generator an electrical explosion resulted at 1815 after the port TG bus was energized from super shore power.
2. Power was immediately secured and the small resulting fire was extinguished with CO<sub>2</sub> from above and below the escape trunk.
3. No further fire or damage resulted.

B. LESSONS LEARNED

1. JAGMAN: "When tagging open circuit breakers and switches, the local manual trip feature should be activated to ensure the breaker/switch is open."
2. JAGMAN: "All reasonably available electrical isolation devices should be used to de-energize equipment to be electrically isolated."

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 5432-83 DATE 14 Aug 83SHIP NAME USS Richard B Russell SHIP# SSN-627LOCATION 1. AT SEA \_\_\_\_\_  
2. MOORED XMare Island Naval Shipyard, CA

## I. THE FIRE/CAUSE

Fire in the Diesel RoomA. CLASS OF FIRE A. \_\_\_\_\_ B. X C. \_\_\_\_\_ D. \_\_\_\_\_B. ALARM TRANSMITTED 1340 DECLARED OUT 1350 DURATION 10 minC. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # EDESCRIPTION Diesel Generator Room

## D. SOURCE OF HEAT OF IGNITION

1. ELECTRICAL _____	7. OPEN FLAME/WELDING _____
2. EXPLOSION _____	8. MECHANICAL FAILURE/ _____
3. COOKING _____	FRICITION _____
4. ENEMY ACTION _____	9. SPONTAN. COMBUSTION _____
5. HOT SURFACES _____	10. HEATING APPLIANCES _____
6. MATCHES/SMOKING _____	11. OTHER (SPECIFY) <u>X</u>
	Unknown

## E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)

1. GAS _____	3. EXPLOS./INCEND. _____
2. FL./LIQ. <u>X-Grease</u>	4. ORDINARY COMB. _____
5. ARSON/SUSPICIOUS? <u>Possible</u>	

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. Person discovered smoke in a bow compartment at approximatel 1340. When he looked into the diesel generator room fire wa seen. Fire was reported via ship's telephone at 1340.
2. Fire announced over 4MC emergency annunciating circuit.



JAG # 5432-83

II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

A. MEANS FOR SPREAD

- |   |                            |
|---|----------------------------|
| 1. HOLE IN DECK/BULKHEAD _____            | 5. FLAMMABLE LIQUID _____  |
| 2. CONDUCTION THROUGH DECK/BULKHEAD _____ | 6. WIND _____              |
| 3. EXPLOSION _____                        | 7. ELECTRICAL CABLES _____ |
| 4. VENT DUCTS _____                       | 8. OTHER (SPECIFY) _____   |

B. MATERIALS INVOLVED IN SPREAD

- |                             |                          |
|-----------------------------|--------------------------|
| 1. GAS _____                | 3. EXPLOS./INCEND. _____ |
| 2. FL./LIQ. <u>X-Grease</u> | 4. ORDINARY COMB. _____  |

C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

1. Open can of grease was not secured properly.

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESS

WOULD EARLY WARNING HAVE MITIGATED THE LOSS?

X\* YES      \_\_\_\_\_ NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

\* Delay in detecting fire.

JAG # 5432-83

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED

- |                    |          |                    |       |
|--------------------|----------|--------------------|-------|
| 1. WATER/FOG       | _____    | 5. PROTEIN FOAM    | _____ |
| 2. PKP             | _____    | 6. HALON           | _____ |
| 3. AFFF            | _____    | 7. OTHER (SPECIFY) | _____ |
| 4. CO <sub>2</sub> | <u>X</u> |                    |       |

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

## PORTABLE EQUIPMENT

- |                    |       |                  |                       |
|--------------------|-------|------------------|-----------------------|
| 1. SPRINKLERS      | _____ | 1. EXTINGUISHERS | <u>CO<sub>2</sub></u> |
| 2. GASEOUS SYSTEMS | _____ | 2. PUMPS         | _____                 |
| 3. WATER HOSELINES | _____ | 3. FOAM          | _____                 |
| 4. PKP/AFFF        | _____ | 4. OBA'S         | _____                 |

## C. ACTIONS TO VENT?

- |                     |       |                        |       |
|---------------------|-------|------------------------|-------|
| 1. MECH. VENT DUCTS | _____ | 1. NATURAL VENTILATION | _____ |
| 2. PORTABLE BLOWERS | _____ | 2. OTHER (SPECIFY)     | _____ |

## D. FIRE FIGHTING ORGANIZATIONS

- |                  |                 |
|------------------|-----------------|
| 1. SHIP'S FORCE  | <u>X</u>        |
| 2. SHORE BASED - | NAVY _____      |
|                  | MUNICIPAL _____ |
| 3. OTHER SHIPS   | _____           |

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Diesel Generator Room

- |                        |                         |                        |          |
|------------------------|-------------------------|------------------------|----------|
| B. DIRECT COST OF FIRE | <u>Less than \$1000</u> | C. OPERATING DAYS LOST | _____    |
| D. REPAIR MAN-HOURS    | _____                   | E. LOSS OF LIFE        | <u>0</u> |
| F. PERSONAL INJURY     | <u>0</u>                | G. DAMAGED             | <u>*</u> |

\* Minor damage to console

JAG # 5432-83

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. At 1340 fire in an open grease can sitting on a workbench in diesel generator room was discovered by person passing by.
2. Alarm announced over 4MC.
3. CO<sub>2</sub> extinguisher used by personnel to extinguish fire. Fire did not spread beyond the grease can.
4. Cause of fire was not determined.

B. LESSONS LEARNED

1. JAGMAN: "There should be continued effort in training for fires and fire prevention."
2. JAGMAN: "Better security is needed to control access to the boat."

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 0848-85 DATE 13 Sept 84SHIP NAME USS Barbel SHIP# SS 580LOCATION 1. AT SEA X  
2. MOORED       Pacific Ocean

## I. THE FIRE/CAUSE

Class C Fire in Propulsion CubicleA. CLASS OF FIRE A.        B.        C. X D.       B. ALARM TRANSMITTED 2354 DECLARED OUT 2356 DURATION 2 minC. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # EDESCRIPTION Main Propulsion Cubicle

## D. SOURCE OF HEAT OF IGNITION

1. ELECTRICAL	<u>X</u>	7. OPEN FLAME/WELDING	<u>      </u>
2. EXPLOSION	<u>      </u>	8. MECHANICAL FAILURE/	<u>      </u>
3. COOKING	<u>      </u>	FRICITION	<u>      </u>
4. ENEMY ACTION	<u>      </u>	9. SPONTAN. COMBUSTION	<u>      </u>
5. HOT SURFACES	<u>      </u>	10. HEATING APPLIANCES	<u>      </u>
6. MATCHES/SMOKING	<u>      </u>	11. OTHER (SPECIFY)	<u>      </u>

## E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)

1. GAS	<u>      </u>	3. EXPLOS./INCEND.	<u>      </u>
2. FL./LIQ.	<u>      </u>	4. ORDINARY COMB.	<u>      </u>
5. ARSON/SUSPICIOUS?	<u>No</u>		

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. At 2353 smoke was seen coming out of the aft part of the Main Propulsion Cubicle.
2. The EWS ordered the cubicle isolated and passed the word "Fire in the Cubicle" via 7MC.

JAG # 0848-85

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

## A. MEANS FOR SPREAD

- |                          |       |                      |       |
|--------------------------|-------|----------------------|-------|
| 1. HOLE IN DECK/BULKHEAD | _____ | 5. FLAMMABLE LIQUID  | _____ |
| 2. CONDUCTION THROUGH    | _____ | FLOW                 | _____ |
| DECK/BULKHEAD            | _____ | 6. WIND              | _____ |
| 3. EXPLOSION             | _____ | 7. ELECTRICAL CABLES | _____ |
| 4. VENT DUCTS            | _____ | 8. OTHER (SPECIFY)   | _____ |

## B. MATERIALS INVOLVED IN SPREAD

- |             |       |                    |       |
|-------------|-------|--------------------|-------|
| 1. GAS      | _____ | 3. EXPLOS./INCEND. | _____ |
| 2. FL./LIQ. | _____ | 4. ORDINARY COMB.  | _____ |

## C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

1. JAGMAN: "An area of high resistance between the incoming power line and the contactor button caused overheating and Class C fire. The nuts that secure the contactor lug to the melamine board had become loose due to vibration."
2. There are no lock washers holding the nuts to the lugs or to the melamine board which is relatively soft.

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESSWOULD EARLY WARNING HAVE MITIGATED THE LOSS?

\_\_\_\_\_ YES        X   NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

JAG # 0848-85

PAGE 3 OF 4

III. ACTIONS/ASSISTANCE

A. EXTINGUISHING AGENTS USED

1. WATER/FOG	_____	5. PROTEIN FOAM	_____
2. PKP	_____	6. HALON	_____
3. AFFF	_____	7. OTHER (SPECIFY)	_____
4. CO <sub>2</sub>	<u>X</u>		

B. SHIPS FIXED EXTINGUISHING SYSTEMS

PORTABLE EQUIPMENT

1. SPRINKLERS	_____	1. EXTINGUISHERS	<u>1-CO<sub>2</sub></u>
2. GASEOUS SYSTEMS	_____	2. PUMPS	_____
3. WATER HOSELINES	<u>*</u>	3. FOAM	_____
4. PKP/AFFF	_____	4. OBA'S	_____

\* Hose was rigged but not used.

C. ACTIONS TO VENT?

1. MECH. VENT DUCTS	_____	1. NATURAL VENTILATION	_____
2. PORTABLE BLOWERS	_____	2. OTHER (SPECIFY)	_____

D. FIRE FIGHTING ORGANIZATIONS

1. SHIP'S FORCE	<u>Damage Control Party</u>
2. SHORE BASED -	NAVY _____
	MUNICIPAL _____
3. OTHER SHIPS	_____

IV. THE DAMAGE

A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Confined to main motor field rheostat assembly.

B. DIRECT COST OF FIRE	<u>\$2452</u>	C. OPERATING DAYS LOST	_____
D. REPAIR MAN-HOURS	_____	E. LOSS OF LIFE	<u>0</u>
F. PERSONAL INJURY	<u>0</u>	G. DAMAGED	<u>*</u>

\* Melamine board, wiring, buttons

JAG # 0848-85

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. At 2353 smoke was seen coming out of the aft part of the Main Propulsion Cubicle.
2. The EWS ordered the cubicle isolated and passed the word "Fire in the Cubicle" via 7MC.
3. A CO<sub>2</sub> portable extinguisher was discharged onto the rheostat assembly and the fire was declared out at 2356. A fire hose was rigged but was not used.
4. DC Party personnel responded within 2 minutes.

B. LESSONS LEARNED

1. JAGMAN: "Research the proper torque values that should be used on the wiring connectors. In view of the age and suspect condition of the equipment in question, submit PMS feedbacks necessary to cause increased attention to the propulsion cubicle."

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 1028-85 DATE 14 Aug 84SHIP NAME USS Barbel SHIP# SS 580LOCATION 1. AT SEA X  
2. MOORED       Near Ford Island, HI

## I. THE FIRE/CAUSE

Class C Fire in Main Propulsion CubicleA. CLASS OF FIRE A.        B.        C. X D.       B. ALARM TRANSMITTED 0707 DECLARED OUT 0715 DURATION 8 minC. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # EDESCRIPTION Main Propulsion Cubicle

## D. SOURCE OF HEAT OF IGNITION

1. ELECTRICAL	<u>X</u>	7. OPEN FLAME/WELDING	<u>      </u>
2. EXPLOSION	<u>      </u>	8. MECHANICAL FAILURE/ FRICTION	<u>      </u>
3. COOKING	<u>      </u>	9. SPONTAN. COMBUSTION	<u>      </u>
4. ENEMY ACTION	<u>      </u>	10. HEATING APPLIANCES	<u>      </u>
5. HOT SURFACES	<u>      </u>	11. OTHER (SPECIFY)	<u>      </u>
6. MATCHES/SMOKING	<u>      </u>		

## E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)

1. GAS	<u>      </u>	3. EXPLOS./INCEND.	<u>      </u>
2. FL./LIQ.	<u>      </u>	4. ORDINARY COMB.	<u>      </u>
5. ARSON/SUSPICIOUS?	<u>No</u>		

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. At 0705 person sighted smoke coming from the Stern Room.
2. At approximately 0707 "Fire in the Cubicle" was passed to Control via 7MC.
3. Fire party not called out.



JAG # 1028-85

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

## A. MEANS FOR SPREAD

- |                          |       |                      |       |
|--------------------------|-------|----------------------|-------|
| 1. HOLE IN DECK/BULKHEAD | _____ | 5. FLAMMABLE LIQUID  | _____ |
| 2. CONDUCTION THROUGH    | _____ | FLOW                 | _____ |
| DECK/BULKHEAD            | _____ | 6. WIND              | _____ |
| 3. EXPLOSION             | _____ | 7. ELECTRICAL CABLES | _____ |
| 4. VENT DUCTS            | _____ | 8. OTHER (SPECIFY)   | _____ |

## B. MATERIALS INVOLVED IN SPREAD

- |             |       |                    |       |
|-------------|-------|--------------------|-------|
| 1. GAS      | _____ | 3. EXPLOS./INCEND. | _____ |
| 2. FL./LIQ. | _____ | 4. ORDINARY COMB.  | _____ |

## C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

1. The cause of the electrical failure was felt to be due to a slight misalignment in the contactors on the Load Bearing Rheostat.

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESS

1. Fire self-extinguished when the cubicle was electrically isolated.

WOULD EARLY WARNING HAVE MITIGATED THE LOSS?

\_\_\_\_\_ YES        X   NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

JAG # 1028-85

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED None

- |                    |       |                    |       |
|--------------------|-------|--------------------|-------|
| 1. WATER/FOG       | _____ | 5. PROTEIN FOAM    | _____ |
| 2. PKP             | _____ | 6. HALON           | _____ |
| 3. AFFF            | _____ | 7. OTHER (SPECIFY) | _____ |
| 4. CO <sub>2</sub> | _____ |                    |       |

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

## PORTABLE EQUIPMENT

- |                    |       |                  |       |
|--------------------|-------|------------------|-------|
| 1. SPRINKLERS      | _____ | 1. EXTINGUISHERS | _____ |
| 2. GASEOUS SYSTEMS | _____ | 2. PUMPS         | _____ |
| 3. WATER HOSELINES | _____ | 3. FOAM          | _____ |
| 4. PKP/AFFF        | _____ | 4. OBA'S         | _____ |

## C. ACTIONS TO VENT?

- |                     |       |                        |       |
|---------------------|-------|------------------------|-------|
| 1. MECH. VENT DUCTS | _____ | 1. NATURAL VENTILATION | _____ |
| 2. PORTABLE BLOWERS | _____ | 2. OTHER (SPECIFY)     | _____ |

## D. FIRE FIGHTING ORGANIZATIONS

- |                  |                 |
|------------------|-----------------|
| 1. SHIP'S FORCE  | _____           |
| 2. SHORE BASED - | NAVY _____      |
|                  | MUNICIPAL _____ |
| 3. OTHER SHIPS   | _____           |

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Damage confined to a Load Balancing Rheostat.

- |                        |                 |                        |          |
|------------------------|-----------------|------------------------|----------|
| B. DIRECT COST OF FIRE | <u>\$305.98</u> | C. OPERATING DAYS LOST | _____    |
| D. REPAIR MAN-HOURS    | _____           | E. LOSS OF LIFE        | <u>0</u> |
| F. PERSONAL INJURY     | <u>0</u>        | G. DAMAGED             | <u>*</u> |

\* Electrical contactors within Rheostat

JAG # 1028-85

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. At 0705 person sighted smoke coming from the Stern Room. As person went to investigate the EWS reported loss of Main Motor Fields and immediately rang up all stop and tripped the main motors off the line.
2. At 0707 the Stern Room phone talker saw a blue flash from the back of the cubicle. Control was notified of the fire via 7MC.
3. The cubicle was completely isolated and it was determined that there was no fire in progress. No further fire fighting action was required.
4. Secured from fire at 0715 and reflash watch posted.

B. LESSONS LEARNED

1. JAGMAN: "A PMS feedback report for MIP C9 4HLU N MRC EL-17/R-1 should be submitted adding two additional parts to step 1g. to read:
  - (4) Check tightness of rheostat buttons to board
  - (5) Check that all rheostat buttons heights are equal."
2. Commander Submarine Squadron ONE: "CO USS BARBEL is directed to review the MRC for adequacy and clarity and to submit a PMS feedback report."

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # 3360-87 DATE 24 Apr 86  
 SHIP NAME USS San Juan SHIP# SSN 751  
 LOCATION 1. AT SEA \_\_\_\_\_  
 2. MOORED X

Under construction at Electric Boat, Groton CT (36% complete)

## I. THE FIRE/CAUSE

Fire in Battery Well

- A. CLASS OF FIRE A. X B. \_\_\_\_\_ C. X D. \_\_\_\_\_  
 B. ALARM TRANSMITTED 0435 DECLARED OUT Unknown DURATION Unknown  
 C. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # \_\_\_\_\_  
 DESCRIPTION Battery Well below FWD Torpedo Room  
 D. SOURCE OF HEAT OF IGNITION
- |                    |          |                                    |                |
|--------------------|----------|------------------------------------|----------------|
| 1. ELECTRICAL      | <u>*</u> | 7. OPENFLAME/WELDING               | <u>*</u>       |
| 2. EXPLOSION       | _____    | 8. MECHANICAL FAILURE/<br>FRICTION | _____          |
| 3. COOKING         | _____    | 9. SPONTAN. COMBUSTION             | _____          |
| 4. ENEMY ACTION    | _____    | 10. HEATING APPLIANCES             | _____          |
| 5. HOT SURFACES    | _____    | 11. OTHER (SPECIFY)                | <u>Unknown</u> |
| 6. MATCHES/SMOKING | _____    |                                    |                |

\* Possible

## E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)

- |                      |           |                    |              |
|----------------------|-----------|--------------------|--------------|
| 1. GAS               | _____     | 3. EXPLOS./INCEND. | _____        |
| 2. FL./LIQ.          | _____     | 4. ORDINARY COMB.  | <u>Pitch</u> |
| 5. ARSON/SUSPICIOUS? | <u>No</u> |                    |              |

## F. ALARM SEQUENCE - METHOD OF ALERTING

1. At approximately 0435 the Electric Boat Division Fire Department responded to an alarm in the forward section of SSN 751.

JAG # 3360-87

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

## A. MEANS FOR SPREAD

- |                          |       |                      |       |
|--------------------------|-------|----------------------|-------|
| 1. HOLE IN DECK/BULKHEAD | _____ | 5. FLAMMABLE LIQUID  | _____ |
| 2. CONDUCTION THROUGH    | _____ | 6. WIND              | _____ |
| DECK/BULKHEAD            | _____ | 7. ELECTRICAL CABLES | _____ |
| 3. EXPLOSION             | _____ | 8. OTHER (SPECIFY)   | _____ |
| 4. VENT DUCTS            | _____ |                      |       |

## B. MATERIALS INVOLVED IN SPREAD

- |             |       |                    |          |
|-------------|-------|--------------------|----------|
| 1. GAS      | _____ | 3. EXPLOS./INCEND. | _____    |
| 2. FL./LIQ. | _____ | 4. ORDINARY COMB.  | <u>X</u> |

## C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

- Two most probable causes were, a short in a vacuum cleaner electrical cord or hot welding slag from carbon arc back gouging operations.
- Fire watches (civilian) were not attentive during welding/gouging operations.

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESS

- No details given.

WOULD EARLY WARNING HAVE MITIGATED THE LOSS?

\_\_\_\_\_ YES      \_\_\_\_\_ NO      X INSUFFICIENT INFORMATION

JAG # 3360-87

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED

- |                    |       |                                    |       |
|--------------------|-------|------------------------------------|-------|
| 1. WATER/FOG       | _____ | 5. PROTEIN FOAM                    | _____ |
| 2. PKP             | _____ | 6. HALON                           | _____ |
| 3. AFFF            | _____ | 7. OTHER (SPECIFY)                 | _____ |
| 4. CO <sub>2</sub> | _____ | <u>Jet X - High Expansion Foam</u> |       |

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

## PORTABLE EQUIPMENT

- |                     |          |                  |       |
|---------------------|----------|------------------|-------|
| 1. SPRINKLERS       | _____    | 1. EXTINGUISHERS | _____ |
| 2. GASEOUS SYSTEMS  | _____    | 2. PUMPS         | _____ |
| 3. WATER HOSE/LINES | <u>X</u> | 3. FOAM          | _____ |
| 4. PKP/AFFF         | _____    | 4. OBA'S         | _____ |

## C. ACTIONS TO VENT?

- |                     |       |                        |       |
|---------------------|-------|------------------------|-------|
| 1. MECH. VENT DUCTS | _____ | 1. NATURAL VENTILATION | _____ |
| 2. PORTABLE BLOWERS | _____ | 2. OTHER (SPECIFY)     | _____ |

## D. FIRE FIGHTING ORGANIZATIONS

- |                  |  |
|------------------|--|
| 1. SHIP'S FORCE  | <u>No (Boat not commissioned)</u>              |
| 2. SHORE BASED - | NAVY   |
|                  | MUNICIPAL <u>Electric Boat Fire Department</u> |
| 3. OTHER SHIPS   | _____  |

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

Confined to Battery Well below Forward Torpedo Room

- |                        |                |                        |          |
|------------------------|----------------|------------------------|----------|
| B. DIRECT COST OF FIRE | <u>Unknown</u> | C. OPERATING DAYS LOST | _____    |
| D. REPAIR MAN-HOURS    | _____          | E. LOSS OF LIFE        | _____    |
| F. PERSONAL INJURY     | <u>0</u>       | G. DAMAGED             | <u>*</u> |

\* 5 battery cells were partially charred or burned, overhead lighting and cabling

JAG # 3360-87

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

1. At approximately 0435 the Electric Boat Division Fire Department responded to an alarm in the forward section of SSN 751.
2. Fire Department extinguished the fire by filling the Battery Well with high expansion foam.

B. LESSONS LEARNED

1. JAGMAN: "The Shipyard Safety Department should inspect battery compartments on ships with battery cells installed."
2. JAGMAN: "The shipyard/contractor should be audited for compliance with safety practices."





APPENDIX D

STANDARD REPORT FORM

## REPORT FORM TERMINOLOGY

A blank Summary Report form is shown on pages D-8 through D-11. The following list explains the terms used in the JAG Summary Report in the order they appear on the form. Appendix G contains definitions of many of the technical terms used here and elsewhere.

- I. THE FIRE/CAUSE: A brief description of the incident is given.
  - A. CLASS OF FIRE. With few exceptions at least one class of fire was noted. Frequently, there were multiple classes of fires. Where this was the case, footnotes were used to indicate the initial fire class.
  - B. ALARM TRANSMITTED, DECLARED OUT, DURATION. In most cases, the time of alarm transmission was the time that the fire alarm was sounded from the bridge or the quarterdeck. Where there was a reflash, the time of reflash was noted.
  - C. COMPARTMENT/ETC. Where provided, the compartment of fire origin was given, by both compartment number, deck and frame location (where available) and by compartment description. Where it was not given or known, the compartment type was designated by the appropriate letter as given in Appendix G.
  - D. SOURCE OF HEAT OF IGNITION. The source of the heat of ignition was indicated as determined from the JAG report.
  - E. FIRST MATERIAL IGNITED.  
E1 through E4 - Appropriate item was checked and a description was given.  
E5 - Where either the JAG "Findings-of-Fact" or "Opinions" determined "arson" to be likely, or where the JAG Report recorded arson as possible this category was checked.
  - F. ALARM SEQUENCE. This was provided in narrative form because the description of the alarm sequence was not always reported on in the "Findings-of-Fact" or "Opinions". Frequently, the "alarm sequence" was found in testimony in enclosures, or pieced together from deck or engineering logs. This narrative usually began with a description of how the fire was first discovered, and continued with the alerting of ship's forces and other,

outside assistance. Detection by human observation or by automatic systems was noted.

## II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

A. MEANS FOR SPREAD. One or more of these categories was normally checked when the fire or smoke was not confined to the compartment of origin. A differentiation was made where possible between fire spread and smoke spread. This category was also checked when there was fire spread between major pieces of machinery or equipment within the same space.

B. MATERIALS INVOLVED IN SPREAD. Used to indicate the means by which fire spread within or beyond the compartment of origin.

C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE. The various factors which contributed to the incident were outlined. Sequence in listing was not meant to indicate order of importance.

SPREAD OF FIRE/FIRE FIGHTING EFFECTIVENESS. The various factors contributing to spread of fire, or inadequacies in fire fighting were noted in outline fashion. Order of appearance in the list is not indicative of order of importance. Included in this category were factors that led to damage or loss. For example, if a door was locked which inhibited fire party entry or prevented a person's safe escape, it was noted.

WOULD EARLY WARNING HAVE MITIGATED THE LOSS? When the loss was significant and there was a delay in discovering the fire "Yes" was checked. If the loss was insignificant "yes" was checked but a footnote was used to indicate the stipulation. If a detection system was in place "Yes" was checked and footnotes were used to clarify and describe. In all other cases "No" or "Insufficient Information" was indicated. If the space was occupied at the time of ignition, "No" was indicated.

## III. ACTIONS/ASSISTANCE

A. EXTINGUISHING AGENTS USED. One or more categories were checked off to indicate what agents were utilized.

- B. SHIPS FIXED EXTINGUISHING SYSTEMS. One or more categories were checked off. "Fixed" extinguishing equipment could be either manually or automatically actuated.
- C. ACTIONS TO VENT. This category identified any means of active fire ventilation as well as any inadvertent actions that led to diffusion or dilution of combustion products, or otherwise led to exhausting smoke from affected areas, either during or after the fire.
- D. FIRE FIGHTING ORGANIZATIONS. Indicates forces used to fight the fire. Private shipyard fire departments were entered as shore based municipal force.

#### IV. THE DAMAGE

- A. THE AREA OF FIRE/SMOKE INVOLVEMENT/NUMBER OF SPACES/LEVEL INVOLVED. Indicates areas of the ship where damage occurred.
- B. DIRECT COST OF FIRE. Generally the dollar loss value entered here was an estimate of repair costs taken directly from the JAG "Findings-of-Fact." These figures were sometimes later revised upwards or downwards in endorsements. The most recent figures were used. There was little consistency in how the dollar loss was reported. Some investigators included the cost of damage control and fire fighting equipment used, some included cost of shipyard and Ship's Force labor; some included only structural contents, or equipment damage. Actual repair or replacement costs were rarely given.
- C. OPERATING DAYS LOST. This category was rarely filled out because it was generally not known or reported. Frequently, the investigation was completed before operating days lost were known.
- D. REPAIR MAN-HOURS (DAYS). When the information was provided this category was filled out.
- E. LOSS OF LIFE. The loss of life figures were taken directly from the JAG "Findings-of-Fact."
- F. PERSONNEL INJURY. Frequently, the number injured identified were only those injuries requiring hospitalization for more than 24 hours. There was no consistency in the basis for injuries reported.

- G. DAMAGE. Specific comments on "items" damaged were added here to supplement the discussion in item "A" above.

V. SUMMARY

- A. NARRATIVE OF EVENTS UNTIL DECLARED OUT. A narrative description of the incident which was provided by the JAG "Findings-of-Fact" and enclosures. The level of detail varies greatly depending on the quality of the investigation.
- B. LESSONS LEARNED. Recommendations and lessons learned as put forth by the investigating and endorsing officers are provided. All sources of information were indicated. HAI sources indicate the engineering judgement of Hughes Associates, Inc.

## NAVY FIRE LOSS HISTORY REPORTING FORM

JAG # \_\_\_\_\_ DATE \_\_\_\_\_  
 SHIP NAME USS \_\_\_\_\_ SHIP# \_\_\_\_\_  
 LOCATION 1. AT SEA \_\_\_\_\_  
 2. MOORED \_\_\_\_\_

## I. THE FIRE/CAUSE

- A. CLASS OF FIRE A. \_\_\_\_\_ B. \_\_\_\_\_ C. \_\_\_\_\_ D. \_\_\_\_\_
- B. ALARM TRANSMITTED \_\_\_\_\_ DECLARED OUT \_\_\_\_\_ DURATION \_\_\_\_\_
- C. COMPARTMENT/FRAME/DECK LOCATION OF IGNITION # \_\_\_\_\_  
 DESCRIPTION \_\_\_\_\_
- D. SOURCE OF HEAT OF IGNITION
- |                          |                              |
|--------------------------|------------------------------|
| 1. ELECTRICAL _____      | 7. OPEN FLAME/WELDING _____  |
| 2. EXPLOSION _____       | 8. MECHANICAL FAILURE/ _____ |
| 3. COOKING _____         | FRICITION _____              |
| 4. ENEMY ACTION _____    | 9. SPONTAN. COMBUSTION _____ |
| 5. HOT SURFACES _____    | 10. HEATING APPLIANCES _____ |
| 6. MATCHES/SMOKING _____ | 11. OTHER (SPECIFY) _____    |
- E. FIRST MATERIAL IGNITED (CHECK 1) (SPECIFY)
- |                            |                          |
|----------------------------|--------------------------|
| 1. GAS _____               | 3. EXPLOS./INCEND. _____ |
| 2. FL./LIQ. _____          | 4. ORDINARY COMB. _____  |
| 5. ARSON/SUSPICIOUS? _____ |                          |
- F. ALARM SEQUENCE - METHOD OF ALERTING

JAG # \_\_\_\_\_

II. FACTORS CONTRIBUTING TO SPREAD OR LOSS

A. MEANS FOR SPREAD

- |   |                            |
|---|----------------------------|
| 1. HOLE IN DECK/BULKHEAD _____            | 5. FLAMMABLE LIQUID _____  |
| 2. CONDUCTION THROUGH DECK/BULKHEAD _____ | 6. WIND _____              |
| 3. EXPLOSION _____                        | 7. ELECTRICAL CABLES _____ |
| 4. VENT DUCTS _____                       | 8. OTHER (SPECIFY) _____   |

B. MATERIALS INVOLVED IN SPREAD

- |                   |                          |
|-------------------|--------------------------|
| 1. GAS _____      | 3. EXPLOS./INCEND. _____ |
| 2. FL./LIQ. _____ | 4. ORDINARY COMB. _____  |

C. EQUIPMENT/MATERIAL/PERSONNEL/DESIGN

CONTRIBUTION TO CAUSE OF FIRE

SPREAD OF FIRE/FIREFIGHTING EFFECTIVENESS

WOULD EARLY WARNING HAVE MITIGATED THE LOSS?

\_\_\_\_\_ YES      \_\_\_\_\_ NO      \_\_\_\_\_ INSUFFICIENT INFORMATION

JAG # \_\_\_\_\_

## III. ACTIONS/ASSISTANCE

## A. EXTINGUISHING AGENTS USED

1. WATER/FOG \_\_\_\_\_  
 2. PKP \_\_\_\_\_  
 3. AFFF \_\_\_\_\_  
 4. CO<sub>2</sub> \_\_\_\_\_

5. PROTEIN FOAM \_\_\_\_\_  
 6. HALON \_\_\_\_\_  
 7. OTHER (SPECIFY) \_\_\_\_\_

## B. SHIPS FIXED EXTINGUISHING SYSTEMS

1. SPRINKLERS \_\_\_\_\_  
 2. GASEOUS SYSTEMS \_\_\_\_\_  
 3. WATER HOSELINES \_\_\_\_\_  
 4. PKP/AFFF \_\_\_\_\_

## PORTABLE EQUIPMENT

1. EXTINGUISHERS \_\_\_\_\_  
 2. PUMPS \_\_\_\_\_  
 3. FOAM \_\_\_\_\_  
 4. OBA'S \_\_\_\_\_

## C. ACTIONS TO VENT?

1. MECH. VENT DUCTS \_\_\_\_\_  
 2. PORTABLE BLOWERS \_\_\_\_\_

1. NATURAL VENTILATION \_\_\_\_\_  
 2. OTHER (SPECIFY) \_\_\_\_\_

## D. FIRE FIGHTING ORGANIZATIONS

1. SHIP'S FORCE \_\_\_\_\_  
 2. SHORE BASED - NAVY \_\_\_\_\_  
                                   MUNICIPAL \_\_\_\_\_  
 3. OTHER SHIPS \_\_\_\_\_

## IV. THE DAMAGE

## A. AREA OF FIRE/SMOKE INVOLVEMENT/# OF SPACES/LEVELS INVOLVED

B. DIRECT COST OF FIRE \_\_\_\_\_

C. OPERATING DAYS LOST \_\_\_\_\_

D. REPAIR MAN-HOURS \_\_\_\_\_

E. LOSS OF LIFE \_\_\_\_\_

F. PERSONAL INJURY \_\_\_\_\_

G. DAMAGED \_\_\_\_\_



JAG # \_\_\_\_\_

V. SUMMARY

A. NARRATIVE OF EVENTS UNTIL DECLARED OUT:

B. LESSONS LEARNED

APPENDIX E

CROSS-REFERENCE MATRIX OF JAG REPORTS

## CROSS-REFERENCE MATRIX OF JAG REPORTS

In order to quickly identify JAG incident report forms that are of interest with respect to a particular category or subject, a cross-reference matrix was developed and is included. An explanation of the terms and rationale used to compile the matrix is given below.

1. Indexing System - The JAG reports were listed in order of increasing JAG numbers, which were listed first by the year in which the JAG investigation was completed, and secondly by the four or five digit number assigned to the JAG report for a particular calendar year. The JAG report number is important because it is the means by which JAG reports can be ordered.
2. Hull Number - The ship type and hull number were listed.
3. Year of the Incident - Generally, the JAG investigation was completed within the same calendar year as the fire incident, or in the next year. There were some cases where the investigation/endorsement process took longer.
4. Location - With few exceptions, the location of the ship at the time of the fire was noted. A "P" for inport means moored at a private shipyard, and an "N" means moored at a Navy facility. Where the specific inport location was not stated, an "X" was entered under "Inport". At-sea was applicable when the ship was steaming under its own power at the time of the incident.
5. Classes of Fire - One or more categories of fire were noted as taken from the JAG reporting form.
6. Explosions/Boiler/Ordinance - Where these incidents were reported on the JAG reporting form they were so noted.
7. Delay in Alarm/Response - Where there was any delay in fire discovery or reporting to the OOD or to the fire department, "DELAY IN ALARM" was checked. Where there was any delay in fire party response once the fire was discovered and the OOD was notified, such as the inability to pinpoint the location of fire, it was so noted.
8. Heat of Ignition - The numbers on the JAG Reporting Form appropriate to this category were entered

directly into the Matrix. For example, a "6" meant the fire was due to matches or smoking.

9. Spread Beyond Compartment of Origin/Fire/Smoke - Where fire or smoke were indicated to spread beyond the compartment of origin on the JAG Reporting Form, an "X" was entered in the appropriate column.
10. Suspicious/Arson - If arson was deduced as definite, probable or possible by the JAG report or by endorsements, this category was checked. If a fire was of undetermined origin, but where the foregoing was not indicated in the JAG report, this category was not checked.
11. Means for Spread - The number on the JAG Reporting Form appropriate to this category was entered directly onto the matrix. For example, a "2" means conduction through a deck or bulkhead.
12. Fire Fighting Deficiencies - When fire fighting personnel experienced problems with equipment, organization, command etc., it was indicated here. However, note that:
  - (a) Problems with OBA's are not included under this column, and
  - (b) Problems in delay in detection and alarm were not included under this column. They are addressed separately under other columns.
13. OBA Problems - Where OBA problems were noted either due to inadequate numbers of OBAs, equipment failure, or training, this box was checked with an "X".
14. Extinguishing Agents - One or more extinguishing agents were checked with an "X" as identified on the JAG Reporting Form.
15. Fixed Suppression Used - Included in this category are any fixed total flooding suppression system activations such as magazine sprinklers, or CO<sub>2</sub> total flooding, whether manually or automatically activated.
16. Venting Used - Where any active means of venting, exhausting or diluting fire gases/smoke was used, either during or after the fire, an "X" was entered here.

17. Venting Needed - Where there was indication in the "Lessons Learned" from either the JAG report or from the opinion of Hughes Associates that more rapid or additional ventilation was needed, an "X" was entered in this column.
18. Fire Fighting Organizations - An "X" was entered in the appropriate category.
19. Direct Cost of Fire - Where the dollar loss was indicated at over \$500,000, an "X" was entered here.
20. Life Loss - The total number of persons reported killed was entered here.
21. No Injured - The total number of persons reported as injured was entered here.

In summary, an "X" entered in a column means either "used", or "yes". A question mark ("?") or no entry means either "not used", "no" or that information was not provided.

1979  
APPENDIX C

**JAG NUMBER**

# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

[illegible]

# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

NO. INJURIES		0	0	0	0	2	6	0	0	0	0	0	0	2	0	0	0	0
LIFE LOSS		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
LOSS, \$500,000							X										X	
FIRE FIGHTING ORGANIZATIONS	OTHER SHIPS		X				X					X						
	MUNICIPAL	X									X							X
	SHORE NAVY			X			X			X		X						
	SHIPS FORCE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VENTING NEEDED																		
VENTING USED				2,3	3	3	3	3	3	3	3	3	3	3	3	3	4	3
FIXED SUPPRESSION USED																		
EXTINGUISHING AGENTS	P. FOAM																	
	CO <sub>2</sub>	X						X	X	X		X	X	X			X	
	AFFF						X	X				X	X					
	PKP	X															X	
H <sub>2</sub> O		X	X	X	X	X	X		X	X	X	X	X	X	X		X	X
OBA PROBLEMS			X				X											
FIRE FIGHTING DEFICIENCIES			X		X		2,5	X	X		X						3	
MEANS FOR SPREAD													1					
SUSPICIOUS/ARSON					X	X				X				X				
SPREAD BEYOND COMPARTMENT OF ORIGIN	SMOKE										X							
	FIRE						X					7						
HEAT OF IGNITION		1	6	6	6	11	1	6	11	7	6	1	2				2	11
DELAY IN	RESPONSE							X	X	X	X							
	ALARM		X				X	X		X	X						X	
EXPLOSIONS	ORDNANCE																	
	BOILER																X	
CLASSES OF FIRE	D																	
	C	X					X											
	B					X											X	
	A		X	X	X		X	X	X	X	X	X						X
LOCATION	AT SEA				X							X						
	IN PORT	79 N	79 P	73 N	79	79 N	79 X	79 X	79 P				79 N	79 N	79 N	80 N	80 P	80 P
YEAR OF INCIDENT		79	79	73	79	79	79	79	79	79	79	79	79	79	79	80	80	80
HULL NUMBER		LPD11	AD26	DDG17	LPA248	DD940	CV62	AOR4	FF1041	DD951	LSD36	AFS4	FF1062	DD933	TAO147			
JAG NUMBER	YEAR	424-80	438-80	626-80	920-80	993-80	1542-80	1831-8										

[illegible][illegible]

# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER

[illegible]



1981-A

## APPENDIX C

JAG NUMBER  
YEAR

## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER YEAR	HULL NUMBER	YEAR OF INCIDENT	LOCATION AT SEA IN PORT	CLASSES OF FIRE A B C D	EXPLOSIONS	DELAY IN RESPONSE ALARM	HEAT OF IGNITION	SPREAD BEYOND COMPARTMENT OF ORIGIN SMOKE FIRE	SUSPICIOUS/ARSON	MEANS FOR SPREAD	FIRE FIGHTING DEFICIENCIES	OBA PROBLEMS	EXTINGUISHING AGENTS	P. FOAM CO <sub>2</sub> AFFF PKP H <sub>2</sub> O	FIXED SUPPRESSION USED	VENTING USED	VENTING-NEEDED	FIRE FIGHTING ORGANIZATIONS	OTHER SHIPS MUNICIPAL SHORE NAVY SHIPS FORCE	LOSS, \$500,000	LIFE LOSS	NO. INJURIES
883-81	CGN36	79	X	X		X	6		X		X		X	X	3	X		X			0	0
1025-81	CV60	79	X	X			11				X		X	X	3			X			X	
1139-81	CG30	80	X	X			3				X		X	X	3	X		X			0	X
2595-81	DDG41	80	N	X			7	X		1	X	X	X	X	3	X		X	X		0	0
NAVEAC 2649-81	DD963	80	N	X			7		X	1	X	X	X	X	3	X		X	X		1	5
2858-81	YFN117	81	N	X			11		X				X	X	3	X			X		0	X
3563-81	AE25	80	X	X		- No Fire								X								
3575-81	LPH3	80	N	X		X	6	X		2	X		X	X	1.3	X		X	X	X	0	0
4009-81		80	P			- No Fire																
4042-81	DDG34	80				- No Fire															0	0
4609-81	FTG7	81	N			- No Fire									1						0	0
4745-81	LPH3	81	X	X			11		X		X		X	X		X		X			0	0
4940-81	AS36	81		X			5											X			0	X
5131-81	CVN68	80	N	X			7						X	X	3			X	X		0	0

## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

[illegible]

1082-A

## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

APPENDIX C  JAG NUMBER YEAR	NO. INJURIES		0	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												</
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# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

77

CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

78

# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

79

**CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES**

JAG NUMBER	YEAR
1	1960
2	1961
3	1962
4	1963
5	1964
6	1965
7	1966
8	1967
9	1968
10	1969
11	1970
12	1971
13	1972
14	1973
15	1974
16	1975
17	1976
18	1977
19	1978
20	1979
21	1980
22	1981
23	1982
24	1983
25	1984
26	1985
27	1986
28	1987
29	1988
30	1989
31	1990
32	1991
33	1992
34	1993
35	1994
36	1995
37	1996
38	1997
39	1998
40	1999
41	2000
42	2001
43	2002
44	2003
45	2004
46	2005
47	2006
48	2007
49	2008
50	2009
51	2010
52	2011
53	2012
54	2013
55	2014
56	2015
57	2016
58	2017
59	2018
60	2019
61	2020
62	2021
63	2022
64	2023
65	2024
66	2025
67	2026
68	2027
69	2028
70	2029
71	2030
72	2031
73	2032
74	2033
75	2034
76	2035
77	2036
78	2037
79	2038
80	2039
81	2040
82	2041
83	2042
84	2043
85	2044
86	2045
87	2046
88	2047
89	2048
90	2049
91	2050
92	2051
93	2052
94	2053
95	2054
96	2055
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100	2059
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102	2061
103	2062
104	2063
105	2064
106	2065
107	2066
108	2067
109	2068
110	2069
111	2070
112	2071
113	2072
114	2073
115	2074
116	2075
117	2076
118	2077
119	2078
120	2079
121	2080
122	2081
123	2082
124	2083
125	2084
126	2085
127	2086
128	2087
129	2088
130	2089
131	2090
132	2091
133	2092
134	2093
135	2094
136	2095
137	2096
138	2097
139	2098
140	2099
141	2100
142	2101
143	2102
144	2103
145	2104
146	2105
147	2106
148	2107
149	2108
150	2109
151	2110
152	2111
153	2112
154	2113
155	2114
156	2115
157	2116
158	2117
159	2118
160	2119
1	

80

# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

## APPENDIX C

JAG NUMBER	YEAR
1	1960
2	1961
3	1962
4	1963
5	1964
6	1965
7	1966
8	1967
9	1968
10	1969
11	1970
12	1971
13	1972
14	1973
15	1974
16	1975
17	1976
18	1977
19	1978
20	1979
21	1980
22	1981
23	1982
24	1983
25	1984
26	1985
27	1986
28	1987
29	1988
30	1989
31	1990
32	1991
33	1992
34	1993
35	1994
36	1995
37	1996
38	1997
39	1998
40	1999
41	2000
42	2001
43	2002
44	2003
45	2004
46	2005
47	2006
48	2007
49	2008
50	2009
51	2010
52	2011
53	2012
54	2013
55	2014
56	2015
57	2016
58	2017
59	2018
60	2019
61	2020
62	2021
63	2022
64	2023
65	2024
66	2025
67	2026
68	2027
69	2028
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71	2030
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81	2040
82	2041
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131	2090
132	2091
133	2092
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136	2095
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138	2097
139	2098
140	2099
141	2100
142	2101
143	2102
144	2103
145	2104
146	2105
147	2106
148	2107
149	2108
150	2109
151	2110
152	2111
153	2112
154	2113
155	2114
156	2115
157	2116
158	2117
159	2118
160	2119
1	

[illegible]



1984-A

## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

APPENDIX C	JAG NUMBER YEAR	NO. INJURIES		0	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</
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## APPENDIX C

JAG NUMBER	YEAR
1	1960
2	1961
3	1962
4	1963
5	1964
6	1965
7	1966
8	1967
9	1968
10	1969
11	1970
12	1971
13	1972
14	1973
15	1974
16	1975
17	1976
18	1977
19	1978
20	1979
21	1980
22	1981
23	1982
24	1983
25	1984
26	1985
27	1986
28	1987
29	1988
30	1989
31	1990
32	1991
33	1992
34	1993
35	1994
36	1995
37	1996
38	1997
39	1998
40	1999
41	2000
42	2001
43	2002
44	2003
45	2004
46	2005
47	2006
48	2007
49	2008
50	2009
51	2010
52	2011
53	2012
54	2013
55	2014
56	2015
57	2016
58	2017
59	2018
60	2019
61	2020
62	2021
63	2022
64	2023
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141	2100
142	2101
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146	2105
147	2106
148	2107
149	2108
150	2109
151	2110
152	2111
153	2112
154	2113
155	2114
156	2115
157	2116
158	2117
159	2118
160	2119
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# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

[illegible]

\* Halon 1301

### CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

## APPENDIX C

JAG NUMBER	YEAR
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## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER	YEAR
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# CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER	YEAR
1	1961
2	1962
3	1963
4	1964
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42	2002
43	2003
44	2004
45	2005
46	2006
47	2007
48	2008
49	2009
50	2010
51	2011
52	2012
53	2013
54	2014
55	2015
56	2016
57	2017
58	2018
59	2019
60	2020
61	2021
62	2022
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140	2100
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143	2103
144	2104
145	2105
146	2106
147	2107
148	2108
149	2109
150	2110
151	2111
152	2112
153	2113
154	2114
155	2115
156	2116
157	2117
158	2118
159	2119
160	2120
1	



## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER	YEAR
1	1961
2	1962
3	1963
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5	1965
6	1966
7	1967
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42	2002
43	2003
44	2004
45	2005
46	2006
47	2007
48	2008
49	2009
50	2010
51	2011
52	2012
53	2013
54	2014
55	2015
56	2016
57	2017
58	2018
59	2019
60	2020
61	2021
62	2022
63	2023
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145	2105
146	2106
147	2107
148	2108
149	2109
150	2110
151	2111
152	2112
153	2113
154	2114
155	2115
156	2116
157	2117
158	2118
159	2119
160	2120
1	

## CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES

JAG NUMBER	YEAR
1	1961
2	1962
3	1963
4	1964
5	1965
6	1966
7	1967
8	1968
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10	1970
11	1971
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44	2004
45	2005
46	2006
47	2007
48	2008
49	2009
50	2010
51	2011
52	2012
53	2013
54	2014
55	2015
56	2016
57	2017
58	2018
59	2019
60	2020
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140	2100
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147	2107
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150	2110
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152	2112
153	2113
154	2114
155	2115
156	2116
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158	2118
159	2119
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**CROSS REFERENCE MATRIX OF JAG FIRE REPORT CATEGORIES**

JAG NUMBER	YEAR
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APPENDIX F

ABBREVIATIONS AND DEFINITIONS  
SPACE DESIGNATION

## **I. ABBREVIATIONS AND DEFINITIONS**

**ACC - Automatic Combustion Control**

**ACC&R - Air Conditioning and Refrigeration Watch**

**AER - After Engine Room**

**AFFF - Aqueous Film Forming Foam, a fluorocarbon  
surfactant, used to float upon and seal the  
surface of flammable liquid fires.**

**AirOps - Air Operations**

**AMR - Auxiliary Machine Room**

**APN - All-Purpose Nozzle (Navy)**

**AS - Automatic Sprinkler**

**ASSW - Anti-Ship Warfare**

**ASW - Anti-Submarine Warfare**

**AUX - Auxiliary**

**ASROC - Anti-Submarine Rocket**

**BMOW - Bosuns Mate of the Watch**

**CASREP - Casualty Report**

**CAT - Catapult**

**CDO - Command Duty Officer**

**Class A Fire - A fire involving ordinary combustible  
materials such as wood, cloth and paper**

**Class B Fire - A fire involving flammable or combustible  
liquids**

**Class C Fire - A fire involving energized electrical  
equipment**

**Class D Fire - A fire involving combustible metals**

CIC - Combat Intelligence Center

CO - Commanding Officer, or Carbon Monoxide

CO<sub>2</sub> - Carbon Dioxide

Conflag (Conflagration Control) Station - On CV's, a compartment located well above the hanger deck which offers an unobstructed view of the deck and movement of aircraft.

CPO - Chief Petty Officer

CVIC - Carrier Information Center

DCA - Damage Control Assistant

DCC or DC Central - Damage Control Central

DFM - Diesel Fuel Marine

Donut - A "donut" is a sludge barge used by ships in port for disposal of bilge pump waste oil discharge.

DSV - Deep Submergence Vehicle

ECM - Electronic Counter - Measures

EEBD - Emergency Escape Breathing Device (used to replace the SSD).

EOS - Engineering Operating Station

EOSS - Engineering Operational Sequencing System

EOOW - Engineering Officer of the Watch

EWS - Engineering Watch Station

FER - Forward Engine Room

FM - Fire Marshall

FOSP - Fuel Oil Service Pump

FP - Fire Pump

GenSpec - General Specifications

GPM - Gallons Per Minute

GQ - General Quarters

GTG - Gas Turbine Generator

HAI - Hughes Associates, Inc.

Halon - Halogenated Extinguishing Agent

HCFF - High Capacity Fog Foam system on the flight deck  
or hanger deck of aircraft carriers (same as  
HICAP).

Helo - Helicopter

HICAP - (see HCFF)

HP - High Pressure

HT - Hull Technician

Huffers - Aircraft starting tractor on CV's

INSURV - Inspection and Survey

INT - Intelligence

JAG - Office of the Judge Advocate General, Department  
of the Navy

JAGMAN - The officer appointed by the captain of the  
ship to conduct the investigation in  
accordance with the Jag Manual (JAGINST  
5800.7B)

JP-5 - A grade of jet fuel, similar to kerosene

LP - Low Pressure

MB5 - A crash fire truck backfitted on all aircraft carriers after the ENTERPRISE fire

1MC - Ship's interior communication (general announcing) system

MG - Motor Generator

Mickey Mouse - Term used in reference to flight deck sound attenuators or helmets.

MMR - Main Machinery Room

MRC - Maintenance Requirement Card

NAS - Naval Air Station

NAVFAC - Naval Facilities

NAVMAT - Naval Material

NAVSAFECEN - Naval Safety Center

NAVSEA - Naval Sea Systems Command

NAVSUP - Naval Supply

NDFO - Navy Distillate Fuel Oil

NIS - Navy Investigative Service

NSFO - Navy Special Fuel Oil

OBA - (self-contained) Oxygen Breathing Apparatus used by the Navy, with oxygen provided by a chemical reaction contained in a replaceable metal cannister

OOD - Officer of the Deck

OPAREA - Operations Area

OPNAV - Operations Naval

PKP - Purple "K" (potassium bicarbonate) dry chemical  
extinguishing agent

POOW - Petty Officer of the Watch

PMS - Planned Maintenance System

PQS - Personnel Qualifications Standard

PSI - Pressure in Pounds Per Square Inch

PVC - Polyvinyl chloride

R&A - Rescue and Assistance Detail

Red Devil - A shipboard electric driven portable blower  
used for desmoking

Reefer - Refrigerator

ROH - Repair and Overhaul

SAR - Search and Rescue

SCBA - Self Contained Breathing Apparatus

SOP - Standard Operating Procedure

SSD - Survival Support Device (same as EEBD)

SSDG - Ship's Service Diesel Generator

S&S - Sounding and Security Watch

SSTG - Ship's Service Turbine Generator

TAU - Twin Agent (PKP, AFFF) mobile fire fighting unit  
(same as TAFES)

TECHEVAL - Technical Evaluation

XO - Executive Officer

XRAY - Watertight condition of a ship. Usually set at  
night.

YOKE - Watertight condition of a ship (more than XRAY,  
less than ZEBRA).

ZEBRA - Most watertight condition of a ship. Usually  
set with General Quarters.

## II. SPACE DESIGNATION

A - Stowage Areas

AA - Cargo Holds

C - Ship and fire control operating areas which are  
normally manned including CIC, communications,  
electronic spaces, pilot house, I.C. rooms,  
plotting rooms

E - Machinery/Engineering Spaces including pump rooms,  
evaporator rooms, emergency generator rooms

F - Diesel fuel, lube oil and fog oil tanks

FF - Cargo fuel tanks

G - Gasoline tanks

GG - Cargo gasoline tanks

J - JP-5 tanks

JJ - Cargo JP-5 tanks

K - Stowage of chemicals, semisafe and dangerous  
materials except gas and gasoline tanks.

L - Living quarters, medical areas, passageways

M - Ammunition Magazine



Q - Areas not otherwise covered including not normally  
manned engineering, electrical and electronic  
areas; galley, laundry, pantries, shops and wiring  
trunks

T - Vertical Access Trunks

V - Void Compartments

W - Compartments storing water including bilge and sump  
tanks.